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GEOLOGICAL SURVEY.

ENGLAND AND WALES.

THE

WATER SUPPLY OF SUFFOLK FROM UNDERGROUND SOURCES:

WITH RECORDS OF SINKINGS AND BORINGS.

BY

WILLIAM WHITAKER, B.A., F.R.S.,

WITH CONTRIBUTIONS BY

H. FRANKLIN PARSONS, M.D., F.G.S.,

HUGH ROBERT MILL, D.Sc., LL.D.,

AND

J. C. THRESH, D.Sc., M.D., D.P.H.

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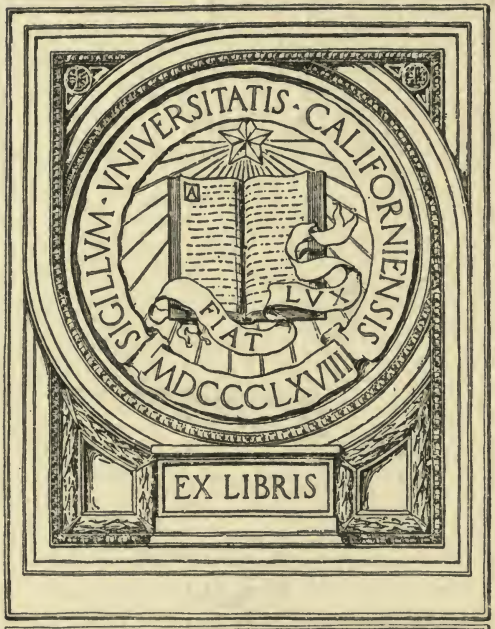
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PREFACE.

THIS is the fourth of the series of County Memoirs dealing with the Water Supply from Underground Sources, the counties already dealt with being Sussex (1899); Berkshire (1902); and Lincolnshire (1904).

In carrying out the work we have been fortunate in securing the services of Mr. WHITAKER, who has been a pioneer in the matter of recording details of well-sinkings and borings.

The principal points of geological interest are the record of the deep boring at Stutton, which was carried out for the Eastern Counties Coal-boring and Development Association, and the further evidence of the great thickness of the Glacial Drift in many places.

Dr. H. R. MILL has supplied particulars as to the rainfall of the county, and has prepared a rainfall-map. Dr. H. F. PARSONS and Dr. J. C. THRESH have materially assisted in the preparation of the Memoir, especially with regard to chemical analyses, and we are greatly indebted to the Local Government Board for many valuable records; also to the engineers, well-sinkers and other observers who have so kindly given information, and whose names are quoted in the body of the Memoir and in the Index.

J. J. H. TEALL,
Director.

Geological Survey Office,
28, *Jermyn Street, London.*
6th February, 1906.

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UNIV. OF CALIFORNIA

THE WATER SUPPLY OF SUFFOLK

FROM UNDERGROUND SOURCES.

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1. INTRODUCTION.

General Remarks on the Wells and Borings of Suffolk.

Suffolk (which forms part of the great geologic tract known as the London Basin) is one of those counties in which the water-supply is chiefly from underground sources : indeed little is got in other ways, except from rain-water and from ponds, in out-of-the-way country-spots.

Only one town, which, however, is amongst the chief places, gets its supply by a purely surface-arrangement, Lowestoft being dependent on Fritton Decoy, a long but very narrow lake some six miles north-westward, which is probably fed to a large extent by springs from sand belonging to the Glacial Drift.

Nor are springs much resorted to for public supply, the chief town, Ipswich, being the great exception ; its supply being partly got from springs flowing out from the Red Crag in and close to the town. Of late, however, the increase of the Ipswich supply has been got from wells, and probably this source will gradually replace the other as the town grows.

Some of the large houses round Ipswich get a good supply from similar springs, thrown out from the base of the Crag by the underlying London Clay, the water being raised by hydraulic rams.

Very many places in Suffolk are without a public supply : indeed, but a comparatively small number of the wells described in the following pages are for public supply or for the use of public institutions, the great majority being private or for trade-purposes.

In this Memoir all published accounts of wells in the county have been collected together and corrections or additions have been made in very many cases. The work of collection, as regards various districts, had already been done in the several Geological Survey Memoirs that deal with Suffolk (*see* List, pp. 163, 164).

The Appendices on Wells in those Memoirs, however, chiefly consist of what was then new and detailed information, got by the Geological Survey, and for help in this work we have to thank my former colleagues H. B. Woodward, C. Reid, F. J. Bennett, J. H. Blake and W. H. Dalton. Before the Geological Survey was carried into the county, our information was mainly limited to a paper by the Rev. W. B. Clarke, published in 1840, which is often referred to in this Memoir.

The Survey Memoirs brought the total number of wells noted up to 470 or more. Since their publication others have been described, to the number of forty-one, in various papers (*see* List p. 165). To these I am now able to add fifty-nine, bringing the total for the county to about 571.

Of course there is a great number of unrecorded wells, especially of shallow wells, in gravel, etc.; but perhaps specimens enough of such shallow wells to show their general nature are now noticed. For the older ones we are largely indebted to the Rev. W. B. Clarke's paper.

Of deep wells probably few have escaped notice, and we have to thank many engineers and well-sinkers for their valuable contributions to our knowledge in this matter. These are duly acknowledged under each account, as also is the help of other friends.

The fifty-seven newly described wells are at the following places :—

Aldeburgh (1903).
Ashbocking.
Ashfield Magna.
Beccles (No. 1).
Belton.
Brandon (3).
Bury St. Edmunds (Nos. 10, 11).
Cockfield (Nos. 4, 5).
Creeting St. Peter.
East Bergholt (Nos. 3, 4).
Elmswell (No. 2).
Euston.
Felsham (Nos. 1, 2).
Fressingfield (Nos. 1, 2).
Gisleham.
Glemsford (Nos. 3, 4, 5).
Great Redisham.
Haughley (No.2).
Henstead.
Hinderclay (No. 1).
Hitcham (Nos. 4, 5).
Hundon (No. 1).
Hunston (Ho. 2).
Ipswich (Nos. 1, 4, 7 second, 9, 11 second, 13 second, 16).
Kettlebaston.
Old Newton (Nos. 2, 3, 4).
Otley.
Poslingford (No. 2).
Risby.
Saxmundham (No. 2).
Shotley (No. 3).
Stansfield (No. 1).
Stoke-by-Clare (No. 1).
Stowmarket (No. 4).
West Creeting.
Westleton (No. 4).
Weston.
West Stow (No. 2).
Whatfield (No. 2).
Withersdale.
Witnesham (No.2).

Notable Wells and Borings.

The entries that are of special geologic interest are as follows :—

Beccles Waterworks. Elaborate section of the Bure Valley Beds, the Chillesford Clay and the Fluviomarine Crag.

Benacre. Great thickness of Upper Crag sand (91 feet, not bottomed).

Brettenham Park. Great thickness of Glacial Drift (312 feet).

Combs. One of the borings that reaches the Gault, through a great thickness of Chalk (817 or 843 feet).

Culford. Reaches through Chalk (526 feet), Gault and Lower Greensand to very old rock (? Silurian).

Euston. Passes through an unexpected mass of Glacial Drift, to the depth of 224 feet.

Fressingfield. Shows a considerable thickness of Glacial Drift, perhaps with some Crag (276 feet).

Glemsford. Near the railway station. Reveals a most unexpected thickness of Glacial Drift, in the low ground of the Valley of the Stour, being indeed the greatest in the kingdom (470 feet). This boring was made the text for a short paper read to the British Association in 1904.

Hitcham. A great thickness of Glacial Drift proved in one section to the extent of 238 or perhaps 250 feet.

Ipswich. Evidence of a channel of Drift close to the Orwell (Nos. 2, 9, 10, 11).

Kessingland. Shows a great thickness of Upper Crag (93 feet, not bottomed).

Leiston. Shows a thickness of more than 130 feet of Upper Crag.

Lowestoft. A great thickness of Upper Crag, one boring passing through 166 feet of the sand of this formation. It is the only case in which the base of the Crag has been reached in the neighbourhood. The boring has also reached the Chalk at the depth of 475 feet. Mr. Reid remarks that the shells from the depth of 146 feet suggest a shifting sand-bank of the Norwich Crag.

Poslingford. A great thickness of Glacial Drift (204 feet).

Saxmundham. Passes through 105 feet of Upper Crag.

Southwold. Proves a thickness of 147 feet of Upper Crag and reaches the chalk at the depth of 323 feet.

Walton. At Langer Fort a thickness of 718 feet of Chalk has been passed through, but without reaching the bottom. The neighbouring deep boring at Harwich (in Essex) gives the total thickness of the Chalk as 890 feet.

Woodbridge. Boring No. 8 passed through a thickness of Red Crag more than double of what would have been estimated from other borings or neighbouring outcrops of that formation, and it

failed to reach the Chalk until a depth had been reached far in excess of that at any of the neighbouring borings (*see* pp.128–130).

Besides these there are many borings, through Drift, Crag and Eocene Tertiaries, to the Chalk, and it is almost wholly from them that we are enabled to make an approximation as to the position of the boundary-line between the Eocene beds and the Chalk under the great sheet of Drift that covers so much of Suffolk.

Of the borings made for other purposes than getting water, the account of which has been kept separate, one is specially notable, being indeed the deepest underground exploration in East Anglia.

At *Stutton* a trial was made to see what rocks came next beneath the Gault, with the hope that Coal Measures might be found. It was then thought that the old rock next beneath the Gault at Harwich, about seven miles eastward, was of Lower Carboniferous age, and that, therefore, the presence of Upper Carboniferous beds in the neighbourhood was probable, though in what direction no one could say. Much older rock, however, was found, perhaps of Silurian age, as also was the case in a later trial at Weeley, in Essex, about seven and a quarter miles southward.

It now seems likely that the Harwich rock may fall into line with those of the three other deep borings that have reached the older rocks in Suffolk and Essex. On this subject see the remarks by Prof. Watts in the Annual Report of the Geological Survey for 1896, pp. 5, 6.

It is of interest to compare the thickness of the Chalk and of the Gault proved by these three neighbouring borings, which show a remarkable likeness, the extreme difference in the total thickness of the Cretaceous beds being only 52½ feet.

	Harwich.	Stutton.	Weeley.	Mean.
Chalk - - - -	890	874½	822½	862⅓
Gault - - - -	61	49½	76	62
Total Cretaceous - -	951	924	898½	924½

Geologic Formations.

In the geology of Suffolk the *Chalk* is, for practical purposes, the lowest formation we have to deal with, and it occurs right through the county. This is the case also in Essex, the next county to the south, and in Middlesex to the west of that. In these three contiguous counties there are very many wells and borings, fairly scattered over the large tract, which pass through overlying beds into the Chalk, and so enable us to make certain of the presence of

that formation throughout, in considerable thickness too. The Chalk then may be called the foundation-rock of Suffolk.

In the north-western part of the county it often forms the surface, though also often capped by Drift deposits. In the south-western part it is almost wholly covered by Drift (Boulder Clay). Passing eastward to the middle district the Chalk is mostly covered by Drift and Crag, whilst on the south (as far west as Sudbury) and on the east it sinks beneath the Eocene Tertiaries, themselves chiefly hidden by Drift. Where pierced through, from top to bottom, at Stutton, the Chalk is 874 feet thick (pp. 141, 142). At Combs, where the uppermost beds are absent, more than 800 feet have been found (p. 39).

The *Eocene Tertiaries*, which succeed in the geologic scale, have no broad outcrops, being mostly hidden under Crag and Drift. Only the Lower London Tertiaries (chiefly Reading Beds) and London Clay occur, and not the topmost part of the latter, any higher beds of the Series that may have been deposited over the area having been eroded away. After the Lower Eocene beds there is a great gap in the geologic sequence in Suffolk.

The greatest thicknesses of these beds recorded are only 170 feet, at East Bergholt (p. 46), 179 feet in one of the borings in Lantern Marshes, and possibly a little more in another (pp. 95, 96).

The chief geologic peculiarity of Suffolk is that it is the head-quarters of the *Crag*. The Coralline Crag is known only in this county, and in very small tracts of it. Of the Upper Crag the variety known as Red Crag is almost confined to Suffolk (except indeed for sundry small patches in Essex), and the variety known as Fluviomarine or Norwich Crag is also well represented, as too are the overlying Chillesford Beds.

The greatest recorded thickness of these Pliocene beds is 170½ feet at Lowestoft (p. 88) Southwold following with 147 (p. 106). It is notable that a far greater thickness of Crag has been found in borings than is anywhere seen at the outcrop.

The *Glacial Drift* forms the greater part of the surface of Suffolk. It is especially its upper member, the Boulder Clay, that covers so large an area; though there are broad tracts of the underlying gravel and sand for some miles inland from the coast, except near the northern border of the county.

The thickness of this Drift varies greatly, up to 470 feet at Glemsford (p. 58) which has become the record-thickness for the kingdom.

The later *River Drift* is confined to the valleys and nowhere forms a broad tract, nor is it anywhere of great thickness.

The accompanying table names the various divisions that are shown on the Geological Survey Maps, with their classification, adding others that are not shown on any of the maps, because they have no outcrop in the county.

List of Geologic Formations.

1. *Divisions that occur at the surface.*

Recent	Coast Deposits.	Blown Sand.
		Shingle.
		Alluvium and Peat.
Pleistocene	River Drift.	Brickearth.
		Gravel and Sand.
		Old River Gravel.
		Gravel, High Level (above the Boulder Clay).
	Glacial Drift.	Boulder Clay.
		Gravel and Sand, with occasional Boulder Clay and Loam.
		Loam or Brickearth.
		Pebbly Gravel and Sand (? or Bure Valley Beds).
Pliocene	Crag.	Chillesford Beds (or Clay).
		Norwich or Fluviomarine Crag and Clay.
		Red Crag and Sand.
		Coralline Crag.
Eocene (Lower)		London Clay.
		Reading Beds (with some Blackheath Beds at top in places, and some Thanet Sand in paces at bottom).
Cretaceous	Chalk.	Upper Chalk.
		Middle Chalk.
		Lower Chalk.

2. *Divisions that do not come to the surface, but the underground existence of which has been proved by borings.*

Cretaceous	Gault.
	Lower Greensand.
Palæozoic	Silurian (?)

It should be noted that the lower part of the Lower Chalk does not come to the surface in Suffolk.

Everywhere the dip of the beds, except in the case of the underground old rocks, is at a very small angle, as far as is known, and the general direction is more or less eastward. There is little evidence of local disturbance, the most notable being in the case of the rise of the Chalk at Ipswich, and this is but a gentle affair.

Such irregularities as occur are owing to the great variation in the thickness of the Glacial Drift, of which evidence is given by many of the sections in the following pages. Apparently channels have sometimes been cut out in the underlying beds before the deposition of the Drift, and these channels sometimes reach to great depth, in one case to far below sea-level.

From this it follows that in the midst of a Drift-covered tract there may be great uncertainty as to the depth to which the Drift extends, and a boring therefore may have to be carried much deeper than might have been expected, in order to reach underlying water-wearing beds. In the notable case of the Glemsford boring one would have thought that the Chalk would have been reached

at a depth of fifty feet or somewhat more, there being no reason to expect any such enormous thickness of Drift as was found.

Water-Bearing Beds.

Beginning at the top of the table on p. 6, and working downward, the beds from which water can be got will now be noticed.

1. A supply is sometimes to be had from the *Blown Sand* and the heaped-up *Shingle* along the coast, and I believe that such a supply was got at Langer Fort, opposite Harwich. In Suffolk, however, there are no broad tracts of this kind and therefore but small supplies can be got, without risk of drawing in salt water.

2. The first notable water-bearing set of beds that we come to is formed by the various *Gravels and Sands* of the Drift Series, which may here be treated together, grouping with them the Pebbly Gravel, the classification of which is somewhat uncertain, or at all events debatable.

When any of these highly permeable beds are of fair thickness (they are never very thick) and cover a large extent of country, as is often the case in Suffolk, they must contain a large amount of water, held up in them by underlying clayey beds. When, however, they rest on permeable beds, such as the Crag and the Chalk, their water may go through and contribute to the stock in those formations.

When water is held in the Drift gravels by underlying clayey beds, then, as that water can have sunk but a small distance downward, this source is often open to objection as a supply, being subject to risk of contamination. Clearly, in populated areas, wells in surface-gravel and sands may be dangerous ; but, on the other hand, where such beds are away from populated areas the water in them may be excellent.

Where wells are made through a protective capping of Boulder Clay or other impermeable bed, a good distance from the outcrop of the gravel, the risk of surface-contamination practically vanishes. These Drift beds, however, are of so uncertain a character that sometimes there may be no gravel beneath the Boulder Clay at some distance within the boundary of the latter.

There are occasional lenticular layers of gravel in the Boulder Clay and when these are of any size they may serve for a small supply, but the water is often of inferior quality.

3. Much the same as has been said of the Drift gravel and sand may be said of the sands of the *Crag* and of the sandy limestone of its lowest member ; but in this case we sometimes have to deal with a greater thickness of material, and it is notable how much thicker the Upper Crag is in some borings than at its outcrop. The Coralline Crag occurs over so small an area that it need not be separately considered ; but it supplies the town of Aldborough.

At the junction of the Crag with the London Clay there are springs, many of which have been used for supply, and where the

surrounding ground is free from risk of pollution good water may be got. The sands of the Crag, however, are often highly ferruginous.

Generally there is fairly free communication between some of the permeable beds of the Drift and the Crag; but sometimes clayey beds in the former may hinder this communication. Where the Chillesford Clay comes on at the top of the Crag, that loamy set of beds must practically separate the water in the overlying gravel or sand from that in the underlying Crag.

4. Below the Crag we meet with a set of beds that are chiefly without water, the *Eocene Tertiaries* consisting mostly of clay. Sandy layers in the London Clay may sometimes give a small local supply; but it must be looked on as a lucky hit to get water from this source. As regards the Lower London Tertiaries beneath, small local supplies may be got: for instance, in the few places where there is some trace of the pebbly and sandy Blackheath Beds at the top, where there are layers of sand in the Reading Beds (which form the chief part of this series), or where there is Thanet Sand at the bottom (on the west); but nothing in the nature of a large supply is to be looked for from any of these sources.

5. *The Chalk* is the chief water-bearing bed of Suffolk, as of many other counties, by reason of its thickness (up to 874½ feet), of its large area of outcrop and of its presence throughout the county; but it does not always yield water in abundance, being sometimes almost dry. In places, too, the water is brackish.

Though covered by Drift, by Crag, by Eocene beds, or by two or more of these over the greater part of Suffolk, yet, as a rule, the covering is of no very great thickness, except at the eastern border, where the Eocene beds come on in force, and in parts where there is a thick mass of Boulder Clay.

The accounts of the many wells and borings that go through the overlying Eocene beds to the Chalk mostly show that the latter is reached within a depth of 200 feet or perhaps within 150. At Leiston and Southwold, however, that depth is greatly exceeded, and at Lowestoft we find as much as 475 feet of overlying beds. This last figure, moreover is nearly reached in a part where there is neither Crag nor Eocene Tertiaries to swell the total, the Drift alone being answerable for 470 feet of beds above the Chalk at Glemsford.

Where the Sandy Crag or the Gravels and Sands of the Drift alone cover the Chalk, of course water will find its way through to the last as well as where it is at the surface: perhaps better, indeed, as rain is likely to sink down into such very permeable beds more readily than into Chalk itself.

The Chalk differs from such open pervious beds in the way in which water travels through it. Probably but little water passes through the actual chalk, which in itself is by no means a highly permeable material: the greater part of the water in the chalk finds its way down and along the cracks, joint-planes and other

fissures, generally so common in the Chalk, and which may be seen in any pit. Some, too, will find its way along planes of bedding, which are generally marked in the Upper Chalk by layers of flints.

There is usually no difficulty in getting a supply of water where the Chalk is at or near the surface; but it is a different matter where it is covered by a thick mass of more or less clayey beds, which often has the effect of sealing up the Chalk, so to speak. Probably the weight of the overlying mass closes the various fissures in the chalk, and so hinders the passage of water, and perhaps the closing of the vertical exit of air may aid slightly in the hindrance. The result of course is that under a great depth of overlying beds water is less easily got from the Chalk.

There is also another difference between the water in the Chalk at great depths and that where the Chalk comes nearer to the surface. In the latter case we have a hard water, containing relatively much carbonate of lime, whilst in the former case we have a softer water, containing less carbonate of lime, but on the other hand some quantity of alkaline salts. This difference in Chalk-water is illustrated by a table of analyses given in a Geological Survey Memoir several years ago, but which does not refer to Suffolk, waters from Essex, Herts., Kent, Middlesex and Surrey being referred to.* Now, however, I am not disposed to insist on the explanation there suggested, namely, of the abstraction of saline matter from the overlying Tertiary beds and its introduction into the Chalk-water (though that may have aided to some extent), for a better theory has been brought forward by Prof. WARINGTON, from chemical researches on various Hertfordshire waters, which led him to conclude that the salts in the higher grounds of the Chalk had been gradually dissolved out and carried down by the flow of underground water to the lower levels.

The varying character of Chalk-waters and the alkalinity of those from deep wells in the neighbouring county of Essex have been noticed by Dr. J. C. THRESH, Medical Officer of Health for that county, in a work that also describes all the public supplies.†

The general question may perhaps be fairly summarised in words used in a Presidential Address to a Hertfordshire Society, as follows: "The washing out of the salts from the Chalk from the escarpment downward to the central parts of the basin, where concentration would take place; the possible addition there of salts derived from the Tertiary sands (between the London Clay and the Chalk); and perhaps some chemical changes slowly brought about in the deep-seated water: these would seem to be enough to

* The Geology of London and of Part of the Thames Valley, 1889, vol. i., folding table opp. p. 533.

† Report on the Water Supply of the County of Essex, 1901, pp. 34–42.

account for the great differences in the mineral contents of the waters in the open and in the covered Chalk."*

It is notable, too, that much common salt has been found to occur in the water of many of the deeper borings, and as there is no evidence of the outcrop of the Chalk in the sea anywhere near the Suffolk coast, one cannot well explain this as resulting from infiltration of sea-water, which, of course, may happen in wells near a Chalk coast, when excessive pumping has taken place. The salinity probably goes with the alkalinity. As the attention of chemists has been drawn to these matters, it is to be hoped that our knowledge may be duly advanced.

Various Statistics.

For the following statistical information I am indebted to Mr. H. Dewey, who has also given me his help in other matters. He himself calculated by planimeter, from the One-inch Geological Survey Maps, the surface areas of the different formations, given in square miles in the following table :—

	Pervious.	Partially pervious.	Mainly impervious.	Percentage of the whole.
Alluvium - - } Brick-earth and loam } -	—	157	—	10·5
Drift gravels and sands -	263	—	—	17·5
Boulder Clay - - -	—	—	879	58·9
Chillesford Clay - -	—	—	3	·2
Red and Norwich Crag (sand) - - -	52	—	—	3·5
Coralline Crag - -	2	—	—	·1
London Clay, with Lower London Tertiaries -	—	—	33	2·2
Chalk - - - - -	106	—	—	7·1
Total -	423	157	915	100
Percentage of area -	28·4	10·5	61·1	100

Of course, it is not pretended that the classification into pervious, etc., is strict: probably no bed is absolutely impervious, though many are practically so. Again, the Boulder Clay varies in character, being occasionally somewhat sandy, and where this formation ends off and is thin, it may allow of considerable percolation. The Chillesford Clay again is sandy and should perhaps have been included in the partially pervious. So also would be the Lower London Tertiaries; but the area they take up at the surface is too small to be separated from that of the London Clay. Anyhow, it is clear that more than half the surface of Suffolk is formed of practically impervious beds, and perhaps a good deal more, as the

* *Trans. Herts Nat. Hist. Soc.*, vol. x., pt. 1, p. 13 (1898). *See* also W. W. Fisher "On Alkaline Waters from the Chalk," *Analyst*, August, 1901.

157 square miles classed as partially pervious will probably contribute more to the impervious than to the pervious. On the other hand, the decidedly pervious beds form more than a quarter, but considerably less than a third, of the surface.

It will be seen that the total area of the county, by Mr. DEWEY's planimeter-measurements, is 1,495 square miles. He notes that in 1891 the area was given as 952,709 acres, or a little over 1,488 square miles, which is under seven square miles less than his measurements; a trifling difference, especially as his figures are based on the old Ordnance Maps.

The above figures deal with the character of the surface; but there is another geologic consideration of great importance as regards water-supply, namely, how the geologic structure of a district affects the access of rain to important water-bearing beds underground. Many years ago I made a set of maps of part of the London Basin from this point of view, as regards the Chalk, for the Metropolitan Board of Works (since replaced by the London County Council) and some years later additions were made to these maps.

Such work can only be done when the various divisions of the Drift have been mapped, and therefore the western part of the London Basin could not be dealt with. As, however, all Suffolk has been mapped with Drift, we can give the figures of the different tracts for that county, and here again I have to acknowledge the help of Mr. DEWEY, who has made the measurements.

In the special set of maps alluded to there is but one area that is the same as on the geologic map, namely, that of the bare Chalk (including of course those parts where there is a covering of soil or wash only). In the other areas we are not concerned merely with the surface, but have to consider everything that comes between the surface and the Chalk; for instance, there may be a thick mass of permeable beds, Drift and Crag, but these may be shut off from the Chalk by a thinner amount of underlying London Clay, which, however, will stop water, sinking through the permeable beds, from getting to the Chalk, and such a tract will therefore be impermeable, as far as getting to Chalk is concerned.

In making such a set of maps of course many doubtful points are met with; but probably errors more or less counterbalance and the certainties largely exceed the doubts. Various questions of this sort have been duly noticed in papers that describe the maps the first from a stratigraphic aspect, the second according to the character of the various areas distinguished by colours on the maps.*

*Some Geological Conditions affecting the Question of Water Supply from the Chalk, *Proc. Norwich Geol. Soc.*, vol. i., pt. viii., pp. 285–294, and *Geol. Mag.* (1884). On the Area of Chalk as a Source of Water Supply, *Health Exhibition Literature*, vol. viii, pp. 364–373, and *Journ. Soc. Arts*, vol. xxxii., no. 1653, pp. 847–851 (1884). Maps showing the Area of Chalk available for Water Supply in the London Basin, *Trans. San. Inst.*, vol. xiii., pp. 243–253 (1892).

In the following table are given the descriptive names of the areas in question and their extent in Suffolk in square miles :—

Bare Chalk		106
Chalk covered by permeable beds only		67
Chalk covered or protected by mixed beds		54
Chalk covered or protected by impermeable beds	Draining toward Chalk at the surface	422
	Not draining toward Chalk at the surface	844

Fractions being omitted these figures come to the total of 1493, which is but little short of the 1495 given for the total area of the county on p. 11.

Suffolk being an agricultural county, the following figures of the acreage under crops and grass may be of interest. They were taken by Mr. DEWEY, from the Returns of the Board of Agriculture, 1904 (Acreage and Live Stock) Table ii, p. 16.

		1903.	1904.
Total Acreage under Crops and Grass		755,742	756,070
Corn Crops	Wheat	90,983	84,172
	Barley or Bere	135,140	135,283
	Oats	51,329	57,852
	Rye	4,428	4,548
	Beans	32,921	36,330
	Peas	17,334	16,387
	Total	332,135	334,572
Green Crops, Potatoes, Cabbages, Vetches, etc.		105,556	104,695
Clover, Sanfoin and grasses under rotation	For hay	77,122	65,662
	Not for hay	30,838	31,330
	Total	107,960	96,992
Permanent pasture or grass, not broken up in rotation	For hay	70,571	68,982
	Not for hay	115,849	119,681
	Total	186,420	188,663
Small fruit		700	747
Bare fallow		22,941	30,393

Note to page 7.

DR. PARSONS sent some remarks to the following effect, after the Memoir was nearly ready for printing off :—On the Boulder Clay tract there is often great difficulty in getting a supply of good water for scattered houses and small villages, where expense precludes the sinking of a deep well into the Chalk. In such places ponds, which collect rainfall from their immediate surroundings, or are fed by a small stream, are often the chief source of supply. DR. E. G. BARNES, Medical Officer of Health for the Hartismere Rural District, has alluded to the necessity of getting water from such ponds, in his Annual Report for 1894. He also notes the existence of wells only 8 or 10 feet deep (especially in the northern parishes of the district, where the subsoil is gravel), which are very liable to contamination. The water from other wells, 30 to 100 feet deep, is much more pure, but very hard. One well only, at the Kerrison Reformatory, is carried 50 or 60 feet into the Chalk and yields pure but hard water.

2. THE RAINFALL OF SUFFOLK

BY

HUGH ROBERT MILL, D.Sc., LL.D.

Secretary, Royal Meteorological Society, Director of the British Rainfall Organisation.

The accompanying Map represents the distribution of rainfall over Suffolk as the average of 35 years' observations, the period running from 1868 to 1902. The data down to 1900 were collected by the late Mr. G. J. Symons, F.R.S., who founded the system of obtaining and publishing rainfall-observations in the British Isles, known as the British Rainfall Organisation, and all the data used have been published annually in "British Rainfall."

The observations have been made for the most part by private observers, and but for the care with which they were sought out, collected and preserved, many of them would probably have been mislaid and lost.

A comparatively small number of stations in the county have records extending over the whole period; but by taking into account stations in the adjacent parts of neighbouring counties it was possible to obtain a series of seven long records to serve as a basis for reducing the numerous shorter records in the county to their value for the same period. Table I. gives the ratio of each year to the mean for the whole period at seven stations and the average of the seven for the years 1868–1902. It is at once apparent that the years from 1875 to 1886 had a rainfall substantially above, while the last ten years had a rainfall considerably below the average. The wettest year was 1872, when the general excess above the mean was 35 per cent.; and in 1882, the next wettest year, the general excess was 31 per cent.

The driest years were 1870, 1887, and 1901, the three being equally dry. Although the general deficiency in the three cases (25, 24, and 25 per cent. respectively) differs by 1 per cent., the difference is so small as to be negligible.

The driest three consecutive years were 1900–1902, which gave an average deficiency of 15 per cent.; this deficiency is rather small on account of the fact that one of the years was scarcely below the mean. The deficiency for the three driest years usually amounts to 20 per cent.

In cases where the record extended over a period shorter than 35 years the mean of the whole set of years available has been corrected by using the ratio-table so as to yield the computed mean value of the rainfall for 35 years. All the figures used in the construction of the Map have thus been reduced to a common period. There is reason to believe that the mean rainfall of any period of 35 years does not differ by more than about 2 per cent. from the mean of any other period of 35 years, and, therefore, for localities with a mean rainfall of about 25 inches, such a mean, if expressed only to the nearest half inch, may be accepted with confidence as the true mean.

After being reduced to the same long period the rainfall-values have been corrected, when necessary, for difference in the heights of the gauges above the ground. The standard height for the receiving surface of a rain-gauge in the British Isles is 1 foot above the ground, and experiments have proved that for every additional foot of height up to about 10 feet there is a falling off of the catch of rain by about 1 per cent. The correction of 1 per cent. per foot

above 1 foot has consequently be n added in the few cases where it was required, but no other correction has been applied to the figures.

There were altogether eighty stations in Suffolk and on the borders of the county the records at which were sufficiently accurate and long continued to justify their use in preparing the Map. From the data afforded by these stations, which were distributed over the county in a satisfactory way, lines were drawn separating all places having a rainfall below 25 inches, from those having a rainfall above 25 inches, the rainfall of the county being so uniform that the mean at the wettest station only differed from the mean at the driest station by about 4 inches. These lines, as reproduced on a small scale map, give as accurate a representation of the distribution of rainfall in the county as it is possible to obtain from existing records.

The area occupied by the drier and the wetter portions and the mean rainfall of each are given below :—

Zone.	Square Miles.	Per Cent. of Total Area.	Mean Rainfall Of Zone.
Below 25 inches	970	65·2	24·3
Above 25 inches	518	34·8	25·3
Total	1,488	100·0	

From these values the mean rainfall for the whole county is found to be practically 24·50 inches, and applying the mean ratios for various years from Table I. we get the following average conditions of the county of Suffolk at various periods.

1868-1902	Mean average	Rainfall	for	Suffolk	24·5	inches
1872	Maximum	,,	,,	,,	33·1	,,
1870, 1887, and 1901	Minimum	,,	,,	,,	18·4	,,
1900–1902	Driest 3 years	,,	,,	,,	20·8	,,

As the stations from which the Map was compiled are sometimes so close together that it necessary to take the mean of several in order to obtain the figure for the spot in question, and as a few short records were taken to fill gaps between long-established stations it is unnecessary to print all the values which have been utilised.

Table II., however, gives particulars of a selection of typical stations arranged from South to North and including the wettest and the driest.

The variation of the rainfall from point to point is so slight that it is hardly necessary to discuss its distribution in the county. It may, however, be noted that the high ground of the East Anglian Ridge, formed by the Chalk on the west and the strip ofcountry just inland of the coast on the east, has a slightly heavier rainfall than the flat river-valleys or the central portion of the plain.

It is well known that the absorption of rain by the rocks depends to a considerable extent upon the season of the year at which it falls. In summer, when evaporation is at a maximum and plant-life is making its greatest demands on the rain as it falls, there is practically no absorption, whereas in winter a large proportion of the total fall goes to augment the underground water-supply. Hence it is important to ascertain the seasonal incidence of rainfall.

Table III. gives the mean monthly rainfall for 35 years, or nearly so, at three typical stations, which represent the county as a whole, and a supplementary table gives the monthly falls expressed as a percentage of the annual total.

It is seen that on the whole the month of maximum rainfall is October, the only exception being July in one instance ; but the column of maximum monthly rainfall shows that heavy falls frequently occur in the summer months, and this is usually as the result of thunderstorms. November

is only a little less wet than October. The minimum rainfall occurs in April, the equally low value quoted for February being an effect due only to the shortness of that month. Exactly half of the annual rainfall occurs in the five months from July to November; the wettest three consecutive months are September to November with about 31 per cent. of the annual fall, and the driest three months are February to April with 19 per cent. of the annual fall.

While the period considered in the discussion was the 35 years, 1868–1902, it may be mentioned that the year 1903 showed an excess of 27 per cent. for the county as a whole, that year having been less wet in Suffolk than in most parts of the country.

TABLE I.

Suffolk Rainfall.

Ratio of each year to the average, 1868–1902.

	Braintree, Bocking.	Ipswich, Bishop's Hill.	Cambridge Observatory.	Walsham-le-Willows.	Barningham.	Diss.	Geldeston	Mean Ratio.
1868	83	81	85	78	78	75	81	80
1869	116	106	104	102	101	109	117	108
1870	80	71	63	75	71	85	81	75
1871	95	88	85	96	96	93	94	93
1872	140	154	126	123	127	132	143	135
1873	102	80	92	89	86	85	77	87
1874	83	65	75	81	79	76	89	78
1875	113	119	122	118	117	107	104	114
1876	115	106	116	115	113	114	114	113
1877	129	116	121	111	101	110	110	114
1878	109	91	115	104	107	110	112	107
1879	134	125	140	128	123	125	128	129
1880	117	101	118	116	108	106	103	110
1881	116	108	118	106	112	117	102	111
1882	126	127	122	131	144	134	130	131
1883	114	100	117	112	120	110	105	111
1884	74	80	81	77	83	81	90	81
1885	118	112	114	110	117	111	108	113
1886	94	102	113	88	101	92	98	98
1887	72	84	70	75	77	78	76	76
1888	108	107	90	102	118	106	94	104
1889	104	117	119	117	108	106	102	110
1890	97	94	80	97	95	103	96	95
1891	103	100	116	105	105	103	103	105
1892	106	130	114	126	130	124	120	121
1893	77	94	94	89	77	87	76	85
1894	97	107	103	110	96	110	111	105
1895	77	83	102	94	89	94	95	91
1896	102	99	93	106	94	101	93	98
1897	84	101	91	86	86	85	83	88
1898	78	89	81	88	85	89	93	86
1899	94	88	86	96	95	93	99	95
1900	88	99	89	103	103	101	104	98
1901	77	76	75	66	73	70	85	75
1902	78	100	70	80	85	78	84	82

Some of these places are outside Suffolk. W.W.

TABLE II.

Mean Annual Rainfall of Suffolk.

STATION.	Height above Ground. Ft.	Height above Ground. In.	Height above Sea Level. Ft.	Period of Observation.	No. of years.	Arithmetical Mean. In.	Computed Mean for 35 years. In.	Computed Mean corrected for height above ground. In.
Erwarton Hall	0	6	75	1876—1902	27	23·57	23·3	23·3
Nayland, Tendring Hall	0	8	135	1868—1888	21	23·64	22·9	22·9
Hadleigh, Boxford	1	0	100	1871—1883	13	25·01	22·7	22·7
Sudbury, Friars St.	1	7	93	1886—1902	17	22·24	23·5	23·5
Alderton Rectory	2	2	30	1886—1902	17	23·18	24·5	24·7
Hadleigh, Aldham	3	0	180	1868—1879	12	25·36	24·7	25·2
Ipswich, Bishop's Hill	1	0	104	1872—1902	31	23·58	23·3	23·3
Lavenham Hall	1	11	220	1878, 1881–1902	23	23·00	23·4	23·4
Clare, Stansfield	1	0	300	1887—1902	16	24·57	26·0	26·0
Rendlesham Hall	1	9	88	1879—1902	24	23·55	23·6	23·6
Saxmundham, Carleton Hall	5	0	50	1868—1883	16	26·54	25·0	26·0
Framlingham, Mt. Pleasant	1	3	125	1880—1897	18	24·92	24·5	24·5
Drinkstone Park	1	6	230	1868—1892	25	24·98	24·0	24·0
Bury St. Edmunds, Hengrave	1	2	91	1883—1902	20	22·10	23·1	23·1
Ixworth, Walsham-le-Willows	0	9	150	1868—1902	35	25·27	25·3	25·3
Stradbroke Rectory	2 1	2 3	172	1882—1886 1888–89, 1894–1902	16	23·93	24·5	24·5
Southwold	1	0	44	1897—1902	6	21·00	24·1	24·1
Halesworth	1	0	60	1875—1882	8	27·67	23·8	23·8
Diss	1	0	96	1871—1895	25	25·92	24·8	24·8
Brandon, Santon	0	10	32	1888—1902	15	22·99	24·0	24·0
Sotterley Hall	0	11	50	1877, 1879, 1881–93 1895–99, 1901–2	22	26·23	26·3	26·3
Carlton Colville	0	6	8	1868—1892	25	26·08	25·1	25·1
Somerleyton Rectory	1	0	50	1868—1875 1880—1896	25	24·37	24·2	24·2

TABLE III

MONTHLY RAINFALL.

Months.	Walsham-le-Willows. 1868–1902.					Ipswich, Bishop's Hill. 1872–1902.				
	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.
	In.	In.		In.		In.	In.		In.	
January	1·64	2·95	1872	·15	1880	1·73	3·78	1872	·14	1880
February	1·58	3·49	1879	·01	1891	1·48	3·19	1879	·05	1891
March	1·72	3·32	1896	·39	1893	1·61	3·53	1872	·21	1893
April	1·61	3·52	1871	·17	1893	1·40	3·25	1882	·15	1893
May	1·86	3·83	1889	·51	1868	1·71	4·14	1878	·38	1895
June	2·09	4·57	1879	·21	1887	1·97	4·39	1902	·44	1887
July	2·69	6·32	1875	·23	1868	2·48	4·42	1875	·12	1878
August	2·28	4·68	1881	·50	1871	1·95	4·52	1892	·25	1899
September	2·53	5·55	1876	·26	1898	2·14	5·08	1885	·30	1898
October	2·63	5·84	1892	·72	1897	2·58	6·51	1892	·47	1897
November	2·44	5·44	1878	1·02	1870	2·53	4·65	1875	(·88)	1901
December	2·20	4·04	1869	·47	1873	2·00	4·11	1886	·44	1873
Year	25·27	33·18	1882	16·77	1901	23·58	35·68	1872	14·97	1874

Months.	Geldeston. 1868–1902.					Mean Monthly Fall expressed as percentage of Annual Mean.			
	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.	Walsham-le-Willows.	Ipswich, Bishop's Hill.	Geldeston.	Mean.
	In.	In.		In.					
January	1·53	2·78	1872	·17	1880	6·5	7·3	6·5	6·8
February	1·40	2·86	1881	·05	1891	6·3	6·3	5·9	6·2
March	1·57	3·38	1869	·27	1893	6·8	6·8	6·6	6·7
April	1·50	3·13	1871	·11	1893	6·4	5·9	6·3	6·2
May	1·71	4·11	1878	·46	1896	7·4	7·3	7·2	7·3
June	1·73	3·01	1898	·16	1887	8·3	8·4	7·3	8·0
July	2·44	5·62	1888	·25	1868	10·6	10·5	10·3	10·5
August	2·07	5·16	1879	·61	1883	9·0	8·3	8·8	8·7
September	2·30	5·15	1885	·28	1898	10·0	9·1	9·7	9·6
October	2·71	7·39	1892	·76	1897	10·4	10·9	11·4	10·9
November	2·53	6·95	1878	·76	1873	9·6	10·7	10·7	10·3
December	2·20	4·36	1869	·39	1873	8·7	8·5	9·3	8·8
Year	23·69	33·91	1872	18·09	1893	100·0	100·0	100·0	100·0

3. WELLS AND BORINGS FOR WATER.

These are arranged alphabetically, by towns or parishes. Words in square brackets have been added by the writer.

Aldeburgh.

The following account of the Waterworks, which are on the western side of the town, about ¼ mile south of the railway-station, is taken from Dr. R. D. SWEETING's Report to the Local Government Board, 1899. See also Dr. THRESH's remarks from that report, on pp. 145-147.

The old source of supply was from an "abstraction reservoir," which "was a shallow well, fed by an elongated ditch impounding water on the borders of Aldeburgh Marsh."

Two supplemental shallow wells, sunk close to the "abstraction reservoir," yielded brackish water and were never used for supply.

After the condemnation of this marsh-collected water by Sir E. FRANKLAND (*see* p. 145), a new abstraction reservoir was made on the inner side of the western wall of the Aldeburgh Park Estate, the old one abutting on the outer side of that wall.

At the date of the Report the various works were "all close to each other . . on rising ground . . about 30 chains distant from the sea and 60 from the tidal river Alde."

"It is computed that three-fourths of the inhabitants . . consume the water supplied by the Company."

"Passing from north to south . . the level . . of the water in wells sunk into the Crag tended to diminish as the site of the water-works was approached," as shown by the following record.

	Ground-level, above O.D.	Water-level.
Brick-kiln Farm (N. of Station) -	- 26·77	3
Station Row - - - - -	- 20·5	1
Waterworks. Collecting Reservoir	- 10	bottom ·15 below O.D.

For Dr. SWEETING's conclusions as to the character of the supply at the time see p. 147. The works have since been acquired by the Corporation.

Mr. R. BATHER has communicated a letter from Mr. J. C. GORDON, Borough Surveyor (1903), giving the following account of new work:—A trench is being excavated, some 1,500 feet long, in fields S.W. of Aldeburgh Hall, and a well sunk. The surface of the ground at the centre of the well is 14·39 feet above Ordnance Datum. The surface of the water 2·39. The well is 18 feet deep, in Coralline Crag, covered with about 2 feet of Glacial Drift. I have been unable to get further particulars.

Alpheton (BRIDGE STREET, a mile south of the Church).

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)

Sunk and communicated by Mr. W. WARREN, of Bury St. Edmunds.
Sand [Drift], 25 feet.

Ampton (The Hall).

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

Sunk and communicated by Mr. W. Warren.

[Glacial Drift]	[Boulder] Clay	40	70 feet.
	Sand - -	30	

Ashbocking (The Lord Nelson Public House, 1903.).

(Ordn. Map 207, N.S.; Geol. Map 50 S.E.)

Made and communicated by Mr. F. Bennett, of Ipswich.

Shaft 93 feet, the rest bored. Tubed from 90 feet 8 inches to 161 feet 1 inch from the surface.

Water stands in the borehole 112 feet down.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift]	Boulder Clay: Dark clay with small portions of chalk and small round flint stones - -	93	93
	Boulder Clay: Blue clay, with the like -	15	108
	Light-coloured sand, with the like -	8	116
	Dark sandy loam - - - -	2	118
	Grey loamy sand - - - -	6	124
	Dark running sand - - - -	11	135
[Red Crag]	Light green crag, with crag-pan -	4	139
	Green loam - - - - - -	½	139½
[Upper Chalk]	Flint bed mixed with chalk - -	1½	141
	Chalk, with flints at 147, 149, 154, 200, 202, 206, 257 and 264 feet -	123	264

It is possible that the dark sand may be Crag instead of Drift.

The section is of interest as being close to where the "approximate boundary" of the Eocene Tertiaries, beneath the thick Drift, is engraved on the Geological Survey Map, Sheet 50, S.E. That boundary, therefore, should be taken a little further southward.

Ashby (On low ground near the Church).

(Ordn. Map 162, N.S.; Geol. Map 67 S.W.)

[Glacial Drift.] Sand, with a little silt overlying, 12 feet.

Ashfield (1, The Lodge; 2, Daisy Green).

(Ordn. Map 190, N.S,; Geol. Map 50 S.E.)

Sunk and communicated by Mr. W. Warren.

	1	2
[Boulder] Clay, to sand and water -	70 ft.	55 ft.

Ashfield Green, *see* Wickhambrook.

Ashfield Magna (Ashfield Lodge, Mr. S. Field's, 1903.).

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Made and communicated by Messrs. Margrett and Allsebrook.
217 feet above Ordnance Datum.
Shaft 96 feet (fitted with 3½ feet of clean ballast at the bottom), the rest bored and lined with steel tubing into the hard chalk.
Water-level, in the boring, 92½ feet down. Abundance of excellent water.

		Thickness.	Depth.
		Ft.	Ft.
Soil, with surface water		20	20
[Glacial Drift (? and Reading Beds)]	Boulder clay	46	66
	Sand	30	96
	Very fine blowing sand, with a very little water	27	123
	Yellow clay	2	125
	Coarse sand with waterworn black [flint] pebbles	1½	126½
	Layer of green coated flints	½	127
[Upper Chalk]	Pasty chalk	5½	132½
	Hard chalk	18½	151
	Chalk with layers of flints and abundant supply of water	9½	160½

Perhaps at the same place as one of the older wells noticed above.

Aspal.

(Ordn. Map 190, N.S.; Geol. Map 50 S.E.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377 (1840).
Water within 40 feet of the surface.

Drift { Diluvial [Boulder] Clay, 70; Sand with water, 10 } 80 feet.

Assington.

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)

1. Vicarage.

Sunk and communicated by Mr. Kingsbury, of Boxford, as also were the other Assington wells (from memory).

Gravelly soil 10; Stony yellow [Boulder] Clay, no water 50 } 60 feet.

2. Another well, S. of the above.

Stony yellow clay 40; Pebbles and blowing sand to water 3 } 43 feet.

3. Dillack's Farm.

Water rose to the surface.

Stony yellow clay 18; Sandy clay 1 } 19 feet.

4. Lane Farm.

Chalky [Boulder] clay - -	30	To water 41 feet.
Sandy clay - - -	10	
Blowing sand and pebbles -	1	

5. Dorking Tye, S.W. of the Village.

(Ordn. Map 223, N.S.; Geol. Map 48 N.W.)
Sunk and communicated (from memory) by Mr. Kingsbury.

Boulder clay - -	60	62 feet.
Blowing sand and pebbles	2	

6. Assington Street.

Yellow clay -	30	32 feet.
Shingle, to water	2	

Assington Green, *see* Stansfield.

Badingham.

(Ordn. Map 191, N.S.; Geol. Map 50 S.E.)
Rev. W. B. Clarke. *Trans. Geol. Soc.*, ser. 2, vol. v., pt. 2, p. 377 (1840).
Diluvial [Boulder] Clay, 80 feet.

Badwell Ash.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. W. Warren.
1. In the Village. 2. The Green.
Boulder Clay, to Sand and Water, in 1, 60 feet, in 2, 50 feet.

Barham (Hall Farm, half a mile E. of the church. 1874).

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)
Information from the tenant (Mr. Hewlitt ?)

Boulder Clay - - - - - - - - -	12 or 15	nearly 70 feet.
Coarse gravel, blue clay, brickearth, sand, blue clay, [Drift, with base-bed of Thanet Sand at bottom?]	about 55	

Barking.

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v. p. 379 (1840).
Diluvial [Boulder] Clay to Chalk, 94 feet.

Barningham (Near the Church).

(Ordn. Map 174, N.S.; Geol. Map 50 N.W.)
From the Well-sinker.

[Boulder] Clay with gravel	30	35 feet.
Chalk - - - - -	5	

Barrow.

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).
Diluvial [Boulder] Clay to water, 130 feet.

2. Barrow Bottom.

[From Mr. Prewer.]

Boulder Clay	4	164 feet.
Chalk - -	160	

3. Barrow Green.

[From Mr. W. Warren.]

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

Boulder Clay	40	160 feet.
Chalk - -	120	

Battisford (For public supply. Two borings).

Ordn. Map 207, N.S.; Geol. Map 50, S.W.

From Mr. G. S. Elliston's

Annual Report on the Bosmere and Claydon Rural District (?1894).

1. Good spring found at the depth of 74 feet.

Through Boulder Clay. Supplies a group of 28 houses.

2. To a depth of 117 feet., into black mud. No drinkable water.

Barton, *see* Great Barton.

Bawdsey (Bawdsey Manor, on the top of the cliff, a little east of the Ferry. 1890.)

(Ordn. Map 208, N.S.; Geol. Map 48 N.E.)

Made and communicated by Mr. F. Bennett, of Ipswich.

Water-level 47½ feet down.

		Thickness.	Depth.
		Ft.	Ft.
Soil - - - - - - - - - - - -		2¼	2¼
[Crag]	White sand - - - - - - -	2¼	4½
	Dark loam sand - - - - - -	11½	16
[London Clay, 87 feet.]	Mottled [discoloured] clay - - -	3	19
	London clay, with rock [septaria] at 62 to 63½, and at 78 to 78 ft. 10 in. -	79	98
	[Basement-bed.] Mottled loam - - -	1½	99½
	[Basement-bed.] Light-coloured sandy loam	3½	103
[Reading Beds, 46 feet.]	Mottled clay - - - - - -	1½	104½
	Brown sandy loam - - - - -	2½	107
	Rock - - - - - - - - -	2	109
	Light-coloured sandy loam - - -	5½	114½
	Mottled clay - - - - - -	5½	120
	Running sand - - - - - -	11	131
	Mottled loam - - - - - -	1	132
	Mottled clay - - - - - -	8	140
	Mottled loam - - - - - -	4	144
	Green loam - - - - - - -	1	145
	Mottled clay - - - - - -	2	147
	Dark green loam - - - - -	1	148
	Flint bed - - - - - - -	1	149
Chalk, with flints at 35 levels, from a foot to 14 feet apart - - - - - - - - - - -		151	300

Beccles.

(Ordn. Map 176, N.S.; Geol. Map 66 S.E.)

1. Messrs. Crisps' Maltings, since 1895.

Bored and communicated by Messrs. Le Grand and Sutcliff. 13 feet above Ordnance datum. Water-level 6 feet down.

	Thickness.	Depth.
	Ft.	Ft.
Dug well (the rest bored) - -	–	22
[Drift] Gravel - - - -	1	23
[Crag ?] Live grey sand - -	46	69
[Crag ?] Live sand and shells -	15	84
Chalk and flints - - - -	66	150

2–4. Waterworks, 1870, 71.

Communicated by Mr. W. M. Crowfoot, from details furnished by Mr. T. M. Quill, combined with a personal inspection of the materials brought up. See *Proc. Norwich Geol. Soc.*, vol. i., pp. 76–9, with small additions from letter of November, 1901.

The wells are "about three-quarters of a mile south of the centre of the town, where the ground rises to a height of about 100 feet above the sea level at Lowestoft. Two borings were made about 100 yards apart," in 1870, and 1871.

"Water first occurred in the Chillesford Sands, held up by the clayey beds beneath. It was abundant and of good quality, and at a depth of 10 feet in these sands, a well 4 feet in diameter supplied 21,000 gallons per day, without appreciably lowering the top water level. This is the water-bearing stratum generally round Beccles, most of the wells being sunk into it."

"The dark silty or muddy bed beneath had a foul marshy smell, which continued for a depth of about 35 feet."

"The shells obtained in this bed, which were stained a dull leaden colour, were considered to belong to the Fluvio-marine Crag of Mr. S. V. Wood." (*See* general list, in the Memoir on "the Geology of the Country around Norwich," 1882, dated 1881, p. 42.)

"Although it seemed that 68 feet was an unusual thickness for Norwich Crag, Mr. Dalton had ascertained that at Saxmundham a well-boring gave 105 feet of Pliocene strata, including the Chillesford and Fluvio-marine divisions. At Beccles these same beds have a thickness of 95 feet; a thickness which has also been proved to be as much at Framlingham."

"In one of the wells at Beccles a boring was carried for 60 feet, and in the other for 73 feet into the Chalk, which was hard, and contained beds of flints at intervals. It yielded in both wells an abundant supply of water."

Including the Bure Valley Beds, and other divisions of the Crag Series, we have here the record of a thickness of 128 feet of Pliocene beds.

(H. B. Woodward.)

BECCLES WATERWORKS. (*Continued.*)

No. 1. 6 feet in diameter to water (80 feet down), then 4½ feet.
Yield 1,800 gallons an hour (1901).

			Thickness.	Depth.
			Ft.	Ft.
Soil			1½	1½
[Glacial Drift]	Boulder. Clay.	Yellow clay	1¼	2¾
		Blue boulder clay, full of small chalk stones, with some flints, thin veins of rotten chalk and various derived fossils (*Gryphœa incurva, Orthea deltoidea Pachyodon, Listeri*?, *Ammonites*, and *Belemnites*	8¼	10
		Thin vein of black mud, hardened and full of small shells		
		Ochreous yellow clay, veins full of chalk stones and some flints: hard to excavate	2	12
	Sands.	Clean hard grit	2	14
		Coarse grey sand	4	18
		Fine sand	13	31
[Bure Valley Beds] Sand and Gravel, 32 feet. Pieces of broken chalk and shells down to nearly 46 feet.		A three-inch vein of light-grey clay at 33½ feet		
		A two-inch vein of yellow clay at 39 feet		
		A seam of coarse rounded gravel at 43½ feet		
		Then dark-red sand, full of gravel to a thin vein of gravel bound by oxide of iron, at 46 feet	25½	56½
		A vein of iron-bound gravel at 52½ feet		
		Then coarse gravel		
		Dark-red sand full of iron and cemented masses of gravel	2?	58½
		Sand, more loamy, little gravel, occasional veins of rotten clay stones, with at bottom a	2½?	61
		Strong vein of iron-bound gravel	2	63
[Chillesford Clay] 14 feet.		Loamy red sand, with very little gravel, loamy veins	7	70
		Red sand, less loamy	7	77
[Chillesford Sand] 12 feet.		Red sand, hardly any gravel. At the bottom a thin vein of damp loamy clay	1	78
		Coarse damp sand	2	80
		Red sand with shells. Thin vein of clay at the bottom	9	89
[Fluvio-marine Crag] 68 feet.		Shelly sand	3 ?	92
		Dark grey sand, nearly a mass of shells	2	94
		Muddy silt, nearly impervious to water	63 ?	157
Chalk			3 ?	160 ?

No. 2. 140 yards east of No. 1. 107 feet above sea-level.

12 feet diameter for 84 feet, then 10½ for 7 feet; then a bore-pipe of 9 inches diameter. Water 77 feet down. Yield 3,400 gallon an hour (1901).

		Thickness.	Depth.
		Ft.	Ft.
Soil	- - - - - - - -	1	1
[Boulder Clay] 10¼ feet.	Yellow clay - - - - -	1½	2½
	Blue boulder clay - - - -	5¼	7¾
	? what - - - - -	3½	11¼
[Sand of Glacial Drift] 17¾ feet.	Clean grey sand - - - -	3¾	15
	More loamy sand - - - -	5	20
	Sand, less loamy - - -	5	25
	Waterworn flint and quartz pebbles in sand - - - - -	3	28
	Sand, more yellow - - -	1	29
[Bure Valley Beds] 33 feet.	Sand, becoming reddish - -	1	30
	Thin vein of black peat in sharp grey sand - - - -		
	Bright yellow sand with quartz pebbles, having spots of Algæ [dendrites ?] on them - -	5	35
	Small pieces of waterworn shells in sharp sand and lumps of fine chalky clay, like pipe-clay	5	40
	Coarse gravel and stones -		
	Coarse grey, red and yellow sand, clean, with some gravel - -		
	Coarse red and yellow gravelly sand; traces of iron - -	5	45
	A good deal of rough gravel -	5	50
	Vein of strong gravel, cemented by oxide of iron - - -		
	Dark-red sand; signs of iron	5	55
	Dead-red sand - - - - -	5 ?	60
	Sheet of gravel bound together by oxide of iron - - - -	2 ?	62
[Chillesford Clay] 15 feet.	Vein of hard loamy sand bound together by oxide of iron- -	1 ?	63
	Red and yellow sand; thin loamy veins - - - - -		
	Vein of iron-bound sand and loam - - - - - -	14	77
	Red, yellow and grey sand, with a little flinty gravel - -		
[Chillesford Sand] 14½ feet.	Red coarse loamy sand, full of pieces of friable shells - -		
	Loamy sand, occasional veins of hardened loam in red sand -	5	82
	White sand mixed with red -		
	A number of shells - - -	3	85
	Veins of hardened loam in sand		
	Clean yellowish-red sand - -	6	91
	Muddy silt, impervious to water. Had a marshy smell - -	½	91½

		Thickness.	Depth.
		Ft.	Ft.
[Fluvio-marine Crag] 65½ feet.	Dark muddy nasty-smelling silt, impervious to water - -	15½ ?	107
	The like mingled with dark slimy clay - - - - - - -	3	110
	Undescribed [? sand]. At 116 feet many pieces of shells echini, etc. At 134 feet the sand became clean, free from mud and smell, and the shells ceased. Then to 137 feet a number of rolled nodules of clay in the sand -	47	157
Chalk - - - - - - - - - - -		130 ?	287 ?

No. 3 well. ¾ mile from the others, close to the river.

Letter from Mr. Crowfoot (1901).

42 feet deep. Yield 4,000 gallons an hour.

"There are town-drains near this well, and though there is no reason to think that the water is affected by them, it is used only for watering the streets. The chalk water [from the other wells ?] is somewhat impregnated with iron."

5. Messrs. Worthington & Co.

Sunk and communicated by Messrs. Le Grand and Sutcliff.

Gravel, sand, etc. - - - - 58 } 84 feet
Chalk, the upper part like pipe-clay - 26 }

The following notes of wells at Beccles were made by Mr. C. Reid :—

6. A well at the Cemetery on the London Road was dug in sand and a little gravel to a depth of 48 feet: shells occured at the bottom.

7. A well at the stone-mason's in the Station Road was dug in sand to the depth of 18 feet.

8. Opposite the free school a well was dug 46 feet deep: shells were met with at the bottom.

9. In Darby's Brickyard, 1 mile S. of Beccles, the well was said to be 60 feet deep (10 feet water), all "in sand and stones, rougher lower down."

10. At Fair Close a well was dug through 15 feet of Boulder Clay to shelly Crag.

11. At Rose Villa, Fair Close, the well was dug in Clay and Chalk, 30 feet, to gravel.

12. The well at the house about 10 chains North of the Pot Yard, Beccles, showed 12 feet of gravel (valley gravel ?).

Beighton Green.

(Ordn. Map 189, N.S.; Geol. Map 50 S.W.)

Communicated by Mr. Warren, of Bury.

Boulder Clay 10 } 35 feet.
Sand - - 25 }

Belstead.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2., vol. v., p. 380 (1840).

Stiff loam 15 } 50 feet.
Crag [?] - 35 }

Belton (Hungry Hall).

(Ordn. Map 162, N.S.; Geol. Map 67 S.W.).
Communicated by Mr. R. H. I. Palgrave.
Water-level, 73 feet down. Useless for household-purposes.

Old well - 68 } 77 feet.
Grey sand 9 }

Benacre (The Hall, 1900).

(Ordn. Map 176, N.S.; Geol. Map 49 N.W.).
Made and communicated by Messrs. Tilley.
About 60 feet above sea-level.

Water from the sand and gravel from 38 to 43 feet down. Below 57 feet no water worth speaking of.

		Thickness.	Depth.
		Ft.	Ft.
Soil		2	2
[Glacial Drift.]	Boulder clay	19	21
	Loamy sand	1	22
	Sand	16	38
	Fine gravel	3	41
[? Drift]	Loamy sand	2	43
	Dead sand	9	52
	Live sand and water (about 3 gallons a minute)	5	57
[? Chillesford Clay]	Light-coloured loam	5½	62½
	Dark loam	½	63
	Light-coloured loam	9	72
[Crag]	Dead sand (shells and very little water)	18	90
	Sand	73	163

Benhall (Mr. Holland's, Benhall Lodge, 1886,87).

(Ordn. Map 191, N.S.; Geol. Map 50 S.E.).
Made and communicated by Mr. F. Bennett, of Ipswich.

Old well, 46 feet, the bottom 5 feet filled with concrete; the rest bored; pipes carried 2 feet 2 inches above the concrete.

Water stood 2 feet 4 inches in the bore-pipe, above the level of the water in the old shaft.

		Thickness.	Depth.
		Ft.	Ft.
? Old well [through Boulder clay and sand]		—	46
[Drift or Crag.]	Running sand	6	52
[Red Crag.]	Shelly crag	22	74
[? London Clay 35 feet.]	London clay	26	100
	Loamy sand	9	109
[Reading Beds, 41 feet.]	Dark stiff clay	5	114
	Mottled clay	4	118
	Mottled loam	9	127
	Light-coloured sand, or sandy loam	3	130
	London or blue clay	17	147
	Dark brown clay	2	149
	Flints (and chalk)	1	150
Upper Chalk, with flints at 210, 214½, 223, 255, 271, 273½, and 284 feet		151	301

Bentley (The Hall).

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.).
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 381 (1840).

Sand	20	30 feet.
Crag	10	

Bergholt, *see* East Bergholt.

Bildeston (Lion Inn).

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.).
Sunk and communicated by Mr. Pettit, of Hadleigh.
Water rose to the surface.

Chalky rubble	5	15 feet.
Chalk - -	10	

The wells in the town generally, according to the same authority, give the section Chalky Clay, 30 feet, and Chalk, 10 feet. The Rev. W. B. Clarke gives the section: Diluvial Clay to Chalk, 60 feet (*Trans. Geol. Soc.*, ser. 2, vol. v., p. 374).

Messrs. Le Grand and Sutcliff note a well here, at 123 feet above Ordnance Datum, in which Chalk was reached 5 feet down.

Blakenham, *see* Great and Little Blakenham.

Blundeston (Warren Farm).

(Ordn. Map 162, N.S.; Geol. Map 67 S.W.).
[Pebbly Series.] Sand and gravel, to water, 16 feet.

Botesdale.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

1. The Lodge.

Boulder Clay, to Sand and water, 70 feet.

2. Lodge Farm.

[Boulder] Clay- -	10	70 feet.
Sand - - -	20	
Chalk - - -	40	

3. Dr. Pierce's.

Gravel and sand -	40	60 feet.
Chalk - - -	20	

4. Lower part of town.

Sand	10	30 feet.
Chalk	20	

Boulge Hall.

(Ordn. Map 207, N.S.; 6 in. Map 67; Geol. Map 50 S.E.)
Ipswich Journal, Aug. 3, 1872, p. 5.

Bad water, containing organic phosphates, shut out by pipes in the upper part. Large supply of good water got from the Chalk.

Large supply of good water got from the Chalk.

To Chalk,	160	250 feet.
In ,,	90	

The well was deepened and a borehole made about 1873.

The following particulars are taken from a letter from Mr. O. T. GIBBONS in Mr. G. Hodson's Second Report (Suffolk Asylum Water-Supply), 1890.

About 116 feet above Ordnance Datum.

Shaft 79 feet, the rest bored; 6 inches in diameter at first, then 4 inches.

Water, from the Chalk, rose to within about 20 feet of the top of the bore-pipe. Supply plentiful. In the well there was plenty of water from the "corprolite white sand;" but it smelt badly, and was not fit for use.

		Thickness.	Depth.
		Ft.	Ft.
[Boulder-Clay.]	Clay - - - - - -	49	49
[Drift ? & Crag.]	Coprolite white sand - -	50	99
[London Clay, 56 feet.]	London Clay - - -	50	149
	? Basement-bed. Green sand similar to turnip-seed -	6	155
[Reading Beds, 40 feet.]	Yellow clay- - - -	25	180
	Green sand, as above - -	15	195
Chalk	- - - - - - -	29	224

This does not agree with the short note above. The more detailed account is presumably the more correct. The water was condemned on analysis.

Boxford.

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)

1. West of the Church (Mr. Kingsbury's House).
Sunk and communicated (from memory) by Mr. KINGSBURY.
Chalky clay, not bottomed, no water, 75 feet.

2. Dr. Gurdon's, 50 yards South of the Church.
Chalky [Boulder] clay, auger dropped and water rose to surface, 40 feet.

3. East of Rectory, between road and stream.
Boggy soil, to chalk, no water, 35 feet.

4. Brewery.

	Thickness.	Depth.
	Ft.	Ft.
Gravel - - -	16	16
? Boulder clay -	2	18
Blue and green clay	30	48
Chalk - - -	6	54

Another account or another well.

	Thickness.	Depth.
	Ft.	Ft.
Gravel - - - -	12	12
Sand - - - -	7	19
Light-coloured clay -	7	26
Reddish-brown clay -	3	29
Dark greenish sandy clay	3	32
Blue clay - - -	3	35
Chalk - - - -	10	45

Bradfield.

(Ordn. Map 189, N.S.; Geol. Map 50 S.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 375 (1840).

Whitish clay -	11	145 feet.
Blue clay - -	100	
Red sand - -	34	

Bradfield Combust (The Hall).

Communicated by Mr. Warren.

Boulder Clay -	30	60 feet.
Sand and gravel -	30	

Bradfield St. George (Parsonage).

Communicated by Mr. Warren.
Water rose to surface.
Boulder Clay to gravel, 170 feet.

Braiseworth (The Rectory).

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. W. Warren.

[Boulder] Clay	23	33 feet.
Gravel - -	10	

Bramfield (Nearly a mile west of The Hall). 1880.

(Ordn. map 191, N.S.; Geol. Map. 50 N.E.)
About 120 feet above Ordnance Datum.
Sunk and communicated by Mr. T. Tilley [and from samples].

		Thickness.	Depth.
		Ft.	Ft.
[Boulder Clay]	Old Well - - - - - -	—	70
[?Crag, over 53 feet.]	Brown sand [fine buff sand], dry	8	78
	Red sandy loam [brown sand], dry - - - - - -	14	92
	Live sand with water [light-grey, nearly buff, micaceous] - -	31⅓	123⅓
[Basement-bed of London Clay.]	Hard calcareous grit, with casts of shells, as a crust over light-grey shelly sand - - -	6⅔	130
[Reading Beds, 36 feet.]	Blue [dark grey] clay - - -	6	136
	Black [peaty] clay - - -	5	141
	Blue clay [dark grey, partly veined buff] - - - -	23	164
	Green sand and flints [dark green sandy clay] - - -	2	166
Chalk [soft] -	- - - - - - - -	84	250

Brandeston Hall.

(Ordn. Map 190, N.S.; Geol. Map 50, S.E.)
A. Le Grand. *Trans. Soc. Engineers* for 1877, p. 141.

? Old well,	16	To Chalk 36 Feet.
Clay, about	20	

Brandon.

(Ordn. Map 174, N.S.; Geol. Map 65.)

1. For the District Council near the Thetford Road.

Made and communicated by Messrs. BARNES and SHARPE, of Sleaford, and from Mr. H. WALKER, of Nottingham.

81 feet 4 inches above Ordnance Datum.

Well, of 8 feet diameter, 74 feet, the rest bored. All in Chalk, 224 feet. The supply came in at from 70–74 feet, at the rate of 4,000 gallons an hour, the bore yielding practically nothing.

2. BRANDON PARK.

Made by Mr. PAGET. Communicated by Mr. H. WALKER.
127 feet 9 inches above Ordnance Datum.
Well, 113 feet; the rest bored. All Chalk, 213 feet.

3. LINGHEATH DROVE (? BRANDON or SANTON DOWNHAM.)

Communicated by Dr. H. F. PARSONS.

About 82 feet above Ordnance Datum.

Yield, 63,166 gallons a day.

Well in Chalk (? under Drift sand) about 65 feet.

Brantham.

(Ordn. Map 224, N.S.; Geol. Map 48 N.W.)

British Xylonite Company. On the Marsh by the side of the Stour, and north of the railway, E.S.E. of Catawade Bridge. 1887.

Made and communicated by Messrs. LE GRAND and SUTCLIFF. With some particulars from Mr. H. MILLER, of Ipswich.

About 5 feet above Ordnance Datum. Bored throughout.

Water found at 10 feet in the Chalk, increasing in quantity as the boring went on; rose to 2½ feet above the ground; and has been tested up to 20,000 gallons an hour.

The water became too salt for use after some time.

		Thickness.	Depth.
		Ft.	Ft.
[River] Gravel		23	23
Blue [London ?] Clay		2	25
[Reading Beds.]	Black and red sandy clay	2	27
	Mixed clay and sand	13	40
	Silty clay and sand	20	60
	Sand and flint	2	62
Soft chalk and flints		100	162

According to a note in *The Engineer*, vol. lxiii., p. 362 (1887), the first 32 feet took several days in boring; but the rest was bored in five days, in one of which no less than 50 feet of chalk and flints were penetrated.

Second well. 1889.

Made and communicated by Messrs. Le Grand and Sutcliff.

Water-level 55 feet down.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Soil		1	0	1	0
[London Clay, 54¾ feet.]	Yellow loamy brickearth	13	0	14	0
	Dark loamy clay	5	6	19	6
	Blue clay, with clay-stone (9 inches) at the bottom	4	10	24	4
	Blue sandy clay	29	8	54	0
	Brown sandy clay	1	9	55	9
[Reading Beds, 49¼ feet.]	Hard mottled clay	3	3	59	0
	Brown sand	3	0	62	0
	Hard mottled clay	4	0	66	0
	Grey mottled clay	1	6	67	6
	Hard dark clay	2	0	69	6
	Green sand	3	6	73	0
	Mottled clay	1	0	74	0
	Hard blue clay	1	6	75	6
	Sand	7	0	82	6
	Hard blue clay	8	0	90	6
	Silty clay	7	0	97	6
	Green sand	6	6	104	0
	Sand, pebbles and flint	1	0	105	0
Chalk and flints		95	0	200	0

This section differs from that of the former well in details, in showing a greater depth, by 43 feet, to the Chalk, and in the water-level being more than 50 feet lower. The site is higher.

Brettenham Park.

By some outbuildings west of the Hall. 1901.

(Ordn. Map. 206, N.S.; Geol. Map, 50 S.W.)

Communicated by Mr. T. C. T. Warner, M.P. (from a statement which was given him by the borers), with some notes from the Rev. Edwin Hill.

About 280 feet above Ordnance Datum.

Shaft 139 feet, the rest bored. An excellent supply of water, to within 140 feet of the surface. The treble pump is driven by electricity.

		Thickness.	Depth.
		Ft.	Ft.
Glacial Drift.	Blue Boulder Clay with chalk-stones. A specimen from the depth of 130 feet slightly brownish	141	141
	Rough red sand	16	157
	Loam-sand with grey clay	5	162
	Fine red running sand	30	192
	Grey clay mixed with red sand	6	198
	Rough red sand with shells; some water with a bad smell	15	213
	Hard rocky substance	4	217
	Conglomerates	5	222
	Plastic clay with flints (apparently Boulder Clay)	90	312
Chalk and occasional beds of flint		232	544

This is of interest in showing a great thickness of Drift, the greatest I think recorded in the county up to the time. The site, in the midst of a wide tract of Boulder Clay, is one where naturally the top of the Chalk would be expected to be at a considerable depth; but not nearly so much as 312 feet. Three years later a still greater thickness of Drift was proved, at Glemsford (see p. 58).

Bricett, *see* Great Bricett.

Brockford.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)
Sunk and communicated by Mr. G. Day, of Eye.

1. The Hall.
Water rose 15 feet.

[Boulder] Clay - -	15	35 feet.
Sand - - -	10	
[Boulder] Clay, to Sand	10	

2. At Mr. Semens'.
Water rose 10 feet.

[Boulder] Clay - -	88	98 feet.
Sand - - -	10	

Broome.

(Ordn. Map 175, N.S.; Geol. Map 50 N.W.)
2 and 3 sunk and communicated by Mr. G. Day.

1. The Swan Inn.

[Boulder] Clay	48	54 feet.
Gravel - -	6	

2. By the Hall Gates.

[Boulder] Clay	45	50 feet.
Red sand -	5	

3. The Hall Laundry.
[Boulder Clay] 57 feet.

Bungay.

(1 in. Map 176, N.S.; 6 in. Map 8; Geol. Map 66 N.E.)

1. For the Parish Council. Since 1895.

Bored and communicated by Messrs. Le Grand and Sutcliff
45 feet above Ordnance Datum. Water-level 28¾ feet down.

	Thickness	Depth
	Ft.	Ft.
Dug well (the rest bored) - - - - - - -	—	31¾
[?Drift or Pebbly Series.] Greenish-grey sand and stones - - - - - - - - - -	4½	36¼
[?Crag.] Greenish - grey blowing sand and shells, with thin bands of blue clay and pebbles - - - - - - -	66¾	103
Chalk and flints - - - - - - - -	67	170

2. Hospital. Communicated by Mr. LAWRENCE.
Sand and gravel, 20 feet.

3. Market Pump. 1812. Communicated by Mr. D. PALMER.
Sand and gravel, 35 feet.

4. Stow Park Farm. Communicated by Mr. D. PALMER.

Boulder Clay -	- 25	80 feet.
Sand and gravel	- 55	

5. Tylor, above the Thatched House Inn. Communicated by Mr LAWRENCE.

[Boulder] Clay	- 40	100 feet.
Sand - -	- 60	

6. Uplands Mill. Information obtained by Mr. C. REID.

Whitish sand and a little gravel	10	40½ feet.
Brickearth - - - -	½	
Brown and orange-coloured gravel	30	

7. The old well at the Castle is 60 to 70 feet deep.

Bury St. Edmunds.

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

1. BARRACKS.

From Mr. PREWER.
2 wells near together.

Boulder Clay	60	4 feet.
Chalk - -	14	75 feet.

2. BRICKYARD, North of Chapel House.

From information on the spot. J. H. BLAKE.

Buff Post Glacial sand, loamy and gravelly in places - - - 7 feet.
Dark blue Boulder Clay with chalk-stones and many large boulders of Lias limestone and of other rocks - - - 30 or 40 feet.

3. CHALK LANE.

From Mr. W. WARREN.

Boulder Clay	- 12	75 feet.
Chalk - -	- 63	

4, 5. From Mr. W. WARREN.

	Crown Street.	Gas Works.
Gravel -	30	8
Sand -	10	15

6. ELDO HOUSE, East of the Town.

From information on the spot. J. H. BLAKE.
Boulder Clay (and sand ?), to Chalk, 40 feet.

7. SOUTH GATE BRICKYARD.

Information from Mr. DURRANT.
Gravel, sand, etc. - - - 20 feet.
Chalk (water at 49 feet) over 29 feet.

8. WELLS STREET.

From Mr. W. WARREN.
Loam 60 feet.
Sand 4 feet.

9. Messrs. Greene King and Co. (Brewery). Since 1895. Bored and communicated by Messrs. Le Grand and Sutcliff. 130 feet above Ordnance Datum. Water-level 48 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Dug well (the rest bored)	- -	—	51
[Upper Chalk]	Chalk and flints - -	49	100
	Chalk and flints, sticky -	28	128
	Chalk and flints - -	23	151

10. Waterworks.

In Chalk over 90 feet, with 2 tunnels. According to Mr. Baldwin Latham (*Trans. Soc. Eng.* for 1864, p. 242), there are two connected wells, which mostly yield 60,000 gallons a day, and have yielded as much as 150,000.

An almost daily record of the depth of water in the well, collected by Mr. G. J. Symons (*Rep. Brit. Assoc.* for 1887, p. 360), extends from July 1, 1876, to January 15, 1877. Depth of well, 91 feet 1½ inches.

This shows the following fluctuations in the depth of water:

July 1 to August 31, a steady fall from 12 feet 6½ inches to 10 feet 5½ inches, remaining the same till September 5.

September 7, a rise to 10 feet 7 inches, remaining the same the next day.

,, 9, a fall to 10 feet 6½ inches.

,, 11, a rise to 10 feet 7½ inches.

,, 12, a fall to 10 feet 7 inches, remaining the same for the next 5 days.

,, 18, a rise to 10 feet 7½ inches, remaining the same till the 26th.

,, 27, a fall to 10 feet 7 inches, remaining the same until October 18.

October 19 to November 10, a gentle fall from 10 feet 6½ inches to 10 feet 2½ inches, remaining the same on November 11.

November 13 to January 15, a steady rise from 10 feet 3 inches to 15 feet 3½ inches.

There are two exceptions in the figures above noted, on August 5 and December 5, obviously caused by misprints of 12 for 11 and of 10 for 11 respectively.

The lowest level was reached on November 10 and 11, and the highest on January 15.

11. The following, made and communicated by Messrs. Merryweather, is of uncertain position.

Clay and flints	33	150 feet.
Chalk - - - -	117	

Other wells in Bury are only in Chalk:—As the Contractor's well at the new School Buildings, near the Botanic Gardens (35 feet to water); East Gate Street (20 feet); Market Place (70 feet); top of Risby Gate Street (75 feet); Westgate Street (15 feet).

Others are in Drift:—As at the bottom of Abbey Gate Street (40 feet of loam); the lower part of Northgate Street (15 feet of gravel); and Southgate Street (30 feet of sand and gravel).

Sewage Farm, *See* **West Stow.**

Capel St. Mary.

(Ordn. Map 207, N S.; Geol, Map 48 N.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 381 (1840).

Diluvial [Boulder] clay	45	85 feet.
Crag sand - -	40	

Carlton Colville (Brickyard, half a mile east of railway-station).

(Ordn. Map 176, N.S.; Geol. Map 67 S.W.)

Glacial Drift	Boulder clay	12	52 feet.
	Sand - -	40	

Castlings Heath—*See* Groton.

Cavenham (The Hall). From Mr. W. Warren.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

Red sand [Valley Drift]	25	55 feet.
Chalk - - - -	30	

Chedburgh. From Mr. Prewer.

(Ordn. Map, 189, N.S.; Geol. Map, 51 S.E.)

The Hall, 18 feet of Boulder Clay to gravel and water.

Close to the Hall, 7 feet of Boulder Clay to sand, from which water rose to the surface.

The Rev. W. B. Clarke notes a well through 36 feet of Boulder Clay, the top 8 feet whitish, the rest blue. *Trans. Geol. Soc.*, ser. 2, vol. v., p. 375 (1840).

Chevington.

(Ord. Map 189, N.S.; Geol. Map 51 S.E.)

1. Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 375 (1840).

		Thickness.	Depth.
		Ft.	Ft.
[Boulder Clay]	White clay - - - - -	10	10
	Blue clay - - - - -	15	25
	Blue gravel - - - - -	1	26
	Blue clay - - - - -	4	30
	Chalk [?marl, or chalky Boulder Clay]	1	31
	Blue clay - - - - -	3	34
	Diluvial chalk - - - -	1	35
	Blue clay - - - - -	2	37
	Chalk [?marl, or chalky Boulder Clay]	2	39
	Blue clay - - - - -	29	68
	Blue clay with *Belemnites*, *Gryphæa*, &c. - - - - - -	52	120

From Mr. Warren.

2. Lodge Boulder Clay, to sand and water, 43 feet.
3. Queen Inn ,, ,, ,, ,, ,, 50 ,,
4. Near the Queen Inn ,, ,, ,, ,, ,, 120 ,,

From Mr. Prewer.

5. Moat Farm Boulder Clay, to land-spring, 40 feet.
6. Half a mile east of Moat Farm ,, ,, ,, ,, 20 ,
7. Near College Farm, 35 feet of sand.
8. Cottage by Moat Farm, Boulder Clay, 13 feet, gravel 7.

Clare.

(1 in. map 206, N.S ; Six-inch map 71 ; Geol. map 47).

1. Rev. W. B. Clarke, *Trans. Geol. Soc.*, series 2, vol. v., p. 375 (1840)

Diluvial [Boulder] clay with chalk-stones	126	163 feet.
Chalk - - - - - - - -	37	

2. Chilton Street, north-west of the town.

Information obtained by Mr. Jukes-Browne.

Gravel - - - -	7	42 feet.
Blue clay (Boulder Clay)	35	

A strong spring at the bottom.

3. Snow Hill (half a mile N. of the Church), by the roadside, 1894.

About 176½ feet above Ordnance Datum.
Made and communicated by Mr. G. Ingold.
Water rose to 15½ feet from the surface.

			Thickness.	Depth.
			Ft.	Ft.
Glacial Drift.	Boulder Clay	White clay -	7	7
		Brown clay -	6½	13½
	Red and green sand - - -		11½	25
Chalk, very rotten and with very few flints	Soft brown chalk - - -		35	60
	Soft white chalk - - -		42	102
	Harder white chalk - - -		38	140

4. Mr. H. W. Smith's. 1883.

Made and communicated by Messrs. Le Grand and Sutcliff.

———		Thickness.	Depth.
		Ft.	Ft.
Dug well [old, the rest bored] - -		—	145
Rubbish and flints - - - - -		5	150
Loamy clay - - - - - -		5	155
Upper Chalk	Putty [very soft] chalk -	63	218
	Hard chalk and flints -	37	255
	Fine sand - - -	2	257
	Chalk and flints - -	125	382

Probably this well is somewhere near, and not at Clare.

Cockfield.

(1 in. map, N.S., 206 ; Geol. map 50 S.W.)

1. Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 375 (1840).
Blue [? Boulder] clay, 126 feet.

In another well the top 20 feet of the clay was white, and the rest (10 feet) contained pyrites and crumbling shells.

2. Half a mile East of the Hall.

Communicated by Mr. WARREN.
Boulder Clay, to sand and water, 103 feet.

3. Post Office rather more than half a mile N.W. of the railway-station. 1890.
Rev. E. HILL, *Quart. Journ. Geol. Soc.*, vol. xlvii., p. 587.
About 270 feet above Ordnance Datum.
Abandoned. No water found below the gravel.

		Thickness.	Depth.
		Ft.	Ft.
Yellow-clay (brick-earth ?) - - - - -		8	8
Red gravel with large flints - - - - -		7	15
Boulder Clay.	Yellow clay with much small chalk - - - - -	3	18
	Blue Boulder Clay with much chalk (well-rounded pebbles) masses of dark [? Kimeridge] clay full of *Ammonites*, often scratched. A chalk boulder 2 ft. long - - - -	40	58
	Broken lumps of chalk and flint	5	63
	Blue clay with sub-rounded chalk fragments - - - -	20	83

4. SMALLBRIDGE COTTAGES, by the road to Bury, ¼ mile N.N.E. from Cockfield Great Green, 1895.

Observed and communicated by the Rev. E. HILL.
290 feet above Ordnance Datum.
Water said to stand 10 feet up.

		Ft.
Boulder Clay, 50 ft.	Red loam or brick-earth, with a sand-gall - - -	4
	Dark chalky Boulder Clay, with flints, scratched chalk and scratched Kimeridge Clay. At about 15 feet a layer, a foot thick, of pieces of chalk, up to 8 inches long, - - - - - - - - about	38
	Whitish wet clay or slime, containing chalk, apparently only a wet form of the dark clay - - about	8

5. RAILWAY STATION, 1902.

Communicated by the Rev. E. HILL.
235 feet above Ordnance Datum.
Shaft 74 feet, the rest bored.
Water rose abundantly to 20 feet below the surface.

All in blue Boulder Clay, with much chalk, all rounded; the small pieces quite oval, the larger pieces up to a foot across. Flints less in quantity; up to 1½ feet across. Some limestone. Scratchings not conspicuous, though usually in wells about here there are many scratched pieces.

Combs (near Stowmarket).

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)

1. Mr. Lankester Webb's Tannery, 1855.

MS. in Geol. Soc. Library.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Drift	Yellow clay, with flints	5	6	5	6
	Vein of sand with clay or marl	7	0	12	6
	Trace of sand	12	2	24	8
	Sand with clay	2	7	27	3
	Sea sand with pebbles on a powerful chalybeate spring	3	3	30	6
Chalk, 843½ft.	Chalk and flints	26	6	57	0
	Chalk without flints	504	0	561	0
	Chalk Marl, more clayey and finer lower down	240	0	801	0
	Chalk Marl, with traces of a green colour and sand increasing and varying in hardness	73	0	874	0
Gault and Greensand alternately		21	0	895	0

A somewhat different account of this well is given by Mr. P. Bruff, *Proc. Inst. Civ. Eng.*, vol. xix., p. 42, as follows:—

		Thickness.	Depth.
		Ft.	Ft.
Drift	Clay to the first springs	30	30
	Sand (very solid)	27	57
Chalk, 817 ft.	Chalk with flints	504	561
	Chalk without flints	240	801
	Chalk with marl	73	874
Upper Greensand [?glauconitic marl]		10	884
Gault		11	895

Information got by Mr. J. H. Blake.	Boulder Clay.	Sand.
	Ft.	Ft.
2 Corner of road near Tricker's Green, ⅞-mile S.W. of church (good supply)	89	2½
3. Parsonage (Tricker's Green)	80	—
4, 5. A little further on same road, towards Combs, 2 wells on either side of the road	73	—
	73	12
6. Corner of road half-a-mile S.E. of the church	51	—

Coney Weston (The "Swan" Inn).

(Ordn. Map 174, N.S.; Geol. Map 50 N.W.)

[Boulder] Clay	20	90 Feet.
Brickearth	20	
Sand	30	
Blue clay	20	

Copdock.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 380 (1840).

Diluvial (Boulder) clay	15	60 feet.
Sand	45	

Coram Street, *see* Hadleigh.

Cotton (Mr. Harries').

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)
Communicated by Mr. W. H. Penning.
Boulder Clay, to sand, 75 feet.

Cowlinge (Farm a mile N.E. of church)

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)
Information got by F. J. Bennett.

Boulder Clay	100	120 feet.
Chalk	20	

Coyts Tye Kiln (S.W. of Kersey). (F. J. Bennett.)

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

Stiff loam	30	60 feet.
Blue clay	30	

Another account divides the upper bed into yellow loam, 15 feet and chalky clay (?white clay), 15 feet.

Creeting.

(Ordn. Map 190 and 207, N.S.; Geol. Map 50 S.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 378 (1840).

Gravel	25	55 feet.
Pebbles in sand	5	
Chalk	25	

See also **West Creeting.**

Creeting All Saints (same authority).

Various soils	74	84 feet.
Diluvial gravel	10	

Creeting St. Mary (same authority).

		Thickness.	Depth.
		Ft.	Ft.
Mixed soil		7	7
[Drift]	Gravel	4	11
	Blue Clay	2	13
	Sand	10	23
	Rocky substance	2	25
Chalk		175	200

Creeting St. Peter (? for public supply).

Communicated by Dr. F. Parsons.
Water-level 65 feet down.
Well and boring, tubed into the Chalk.

Boulder Clay with veins of sand, yielding impure water	140	285 Feet.
Chalk - - - - - - - - - - - -	145	

Crowfield (Crowfield Street, ? Stone Street).

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)
G. Maw, *Quart. Journ. Geol. Soc.*, vol. xxiii., pp. 110, 111.

	Thickness.	Depth.
	Ft.	Ft.
Loamy gravel on the surface - - - - - -	4	4
Boulder Clay - - - - - - - - - -	53	57
Drift sands and gravels, with much chalk-detritus, varying in character, and with consolidated blocks -	43	100
Chalk - - - - - - - - - - - -	11	111

Mr. C. B. Rose gave a slightly different version (? of the same well "Crowfield") in *Geol. Mag.*, vol. iv., p. 278, thus:—

Tough Boulder Clay -	55	To Chalk, 100 feet.
Sand and gravel, about -	45	

Culford.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

1. The Hall.

Made and communicated by Messrs. Le Grand and Sutcliff.
Water-level 47 feet down, June 1889.

Clay and stone -	2	87 Feet.
Chalk and flints -	85	

2. Just outside the northern edge of the Park.

For the purpose of getting soft water for new buildings on the Earl of Cadogan's estate, 1901.
About 110 feet above Ordnance Datum.
Boring of six inches diameter [chiefly ?], lined with pipes of 5 inches diameter to 583 feet down.
Made and communicated by Messrs. Le Grand and Sutcliff.
With numbered notes on samples, by Mr. A. J. Jukes-Browne, in brackets.

The following account is compiled from the details given in *Quart. Journ. Geol. Soc.*, vol. l., pp. 489-496. In that paper Mr. Jukes-Browne first gave the section, as communicated by the well-sinkers; then a description of the samples with which they supplied him; and lastly his suggested classification of the beds.

There is some difficulty in codifying these, as the suggested divisions between the Chalk and the Gault and between the Gault and the Lower Greensand come in the middle of beds, as described by the well-sinkers, which beds therefore I have had to divide, in making a combined section from the three sources.

Where detailed descriptions of samples were given I have referred to the original paper.

		Thickness.	Depth.
		Ft.	Ft.
	Pit [in Drift ?], the rest bored - - - -	—	6
[Upper and Middle Chalk.]	Chalk and flints - - - -	341	347
	Hard chalk and flints - - -	26	373
	Chalk-rock, with a layer of flints at the base. (1. Rather hard yellowish marly chalk, like material from below the Melbourn Rock elsewhere) - - - - -	16	389
[Lower Chalk, 143 feet.]	Hard chalk, with a layer of flints at the base. (2. Compact, rather hard, homogeneous, white chalk. Its microscopic character most resembles Upper Chalk. 3. Flint, black throughout, without rind. These may be from material that has fallen from above) - - -	18	407
	Hard chalk - - - - - -	7	414
	Soft chalk - - - - - -	4	418
	Chalk, rather hard. (4. Sample very soft, pulverulent, white. May be part of a mashed-up core) - -	59	477
	Chalk, getting like marl - - -	6	483
	Grey chalk-marl. (5. Light-grey marl, like Upper Gault of Norfolk)	49 and	532
[Gault, 73 feet.]	Sample presumably from lower part Gault. Dark grey clay. (6. Dark grey marl. 7. Phosphatic nodules and fossils. *Belemnites attenuatus*, *Nucula pectinata*, fish-vertebræ and part of a gasteropod. 8. Dark-grey clay) - - -	30 / 36	562 / 598
	Sandy Gault. (9. Dark grey sandy clay. Another sample, from 600 feet, dark clay, with larger grains of sand) - - - - - -	7 and 20	605 / 625
[Lower Greensand 32½ feet.]	Sandy Gault and stone, in alternating layers. (10. Very soft wet sandy clay. 11. Several samples. Greyish-brown stone, from 632 feet, with small brown decomposed oolitic grains of iron ? Piece of lignite. Fragment of Ammonite. The grittiness of these stones due to shell-fragments.) For details of all these samples, see *Quart. Journ. Geol. Soc.*, vol. l., pp. 491, 2. - - - - - -	11	636
	Greensand stone. (12. Light-grey calcareous rock, like the grey stone above; mainly composed of organic remains.) Details in *Quart. Journ. Geol. Soc.*, vol. l., p. 492 -	1½	637½

		Thickness.	Depth.
		Ft.	Ft.
[Palæozoic. ? Silurian or older.]	Claystone. (13. Hard light-greenish-grey, slaty rock; showing two sets of cleavage-planes, one at an angle of about 60°, the other form-jagged edges on the broken surface and nearly parallel to the vertical face of the core, from 638 feet) -	2½	640
	Shaly stone. (14. Sample from 647 feet a mash-up of soft grey, shaly rock, with fragments of hard slate. Another, from 650 feet, dark grey compact rock with white veins ? hornstone or argillite with quartzose veins. A third, from 657 feet, dark grey slaty rock. Mr. TEALL examined microscopically several slides from these rocks. One, from between 645 and 647 feet, is a fine-grained siliceous stone of the lydianite or hornstone type, with quartz-veins. Another from 657 feet, is composed of exceedingly fine particles, amongst them quartz-grains and mica-scales) - - - - - - -	17¼	657¼

Mr. JUKES-BROWNE by no means puts forward the above classification as certain. He remarks that we are "without evidence as to the base of the Chalk," and that there is "some little doubt as to the base of the Gault," and his suggestions are largely dependent on calculations from the thicknesses of Lower Chalk and of Gault in places to the west.

Moreover there is some contradiction amongst samples, one that I sent him, later, marked as from 624 feet, being clean Gault clay. Should this have been rightly marked, it would (as he allows in a letter) carry the Gault down to 625 feet, unless the sample came from fallen material.

I am rather disposed to this view, which would make the Gault 93 feet thick, and the Lower Greensand only 12½, for the latter formation is the one that one would expect to thin away sooner in its underground course eastward, and it is not of great thickness at the nearest outcrops. The Gault, on the other hand, thins gradually eastward from its outcrop, as proved by the borings at Stutton, Harwich, and Weeley, where it is respectively 49½, 61 and 76 feet thick; but in none of those borings is there a trace of Lower Greensand. To the north of course it is the Gault clay which thins out, along its outcrop through Norfolk, and is but 10 feet thick in the boring at Holkham.

Mr. JUKES-BROWNE remarks, in the above-quoted paper, that "With respect to the beds between 625 and 636 feet, the brown sandstone enclosing lignite has the aspect of . . . Lower Greensand, but the calcareous beds do not resemble any part of that group exposed in Cambridgeshire or Norfolk." However, he recognised a likeness to the beds in the Richmond boring classed as Neocomian by Prof. JUDD.

As to the Palæozoic rocks we cannot classify them with any safety.

For further details the reader is referred to the original paper.

Dallinghoo (Post Office).

(Ordn. Map 207, N.S.; Geol. Map 50 S.E.)
The Rev. R. A. Bullen, *Quart. Journ. Geol. Soc.*, vol. lvii., pp. 285, 286 (1901).
About 161 feet above Ordnance Datum.
Water found at the depth of 79 feet.

		Thickness.	Depth.
		Ft.	Ft.
Glacial Drift.	Blue chalky Boulder Clay, with various derived fossils (*Ammonites excavatus, A. Jason, A, raricostatus, Belemnites abbreviatus, B. Owenii,* and others), and with various rocks, etc. (race, fibrous gypsum, selenite, iron-pyrites, sandstones and argillite) - - -	53	53
	Reddish sand and gravel - - -	1	54
	White sand and gravel - - -	16	70
	Red sand and gravel - - - -	9	79

In the sand Cretaceous chert, with sponge-spicules and foraminifera, was found. In the sand itself Cretaceous foraminifera were also found. The sand consists largely of quartz grains, subangular and rounded, a few with crystalline facets. There are also fragments of flint, chert and lignite. Details are given by Mr. Bullen.

Debden or Depden.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)
1. Near the Elms (from Mr. W. Warren).
Boulder Clay to sand and water (which rose 60 feet), 180 feet.
2. Parsonage. Boulder Clay to Chalk and water, 200 feet.

Drinkstone.

(Ordn. Map 189, N.S.; Geol. Map 50 S.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).
Diluvial [Boulder] clay, 70 feet.
The Park. Communicated by Mr. W. Warren.
Gravel, 25 feet.

Earl Stonham (Rectory).

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)
[Sir] J. B. Phear, *Trans. Cambridge Phil. Soc.*, vol. ix., p. 438.
[Boulder Clay ?] to gravel, with water, 40 feet.

East Bergholt.

(Ordn. Map 224, N.S.; Geol. Map 48 N.W.)
1. Arnold's.
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 371 (1840).

Gravel - - -	3	14⅓ feet.
Loam, gravel, and sand	11	
Clay, to sand and water	⅓	

2. The Rectory.

Rev. W. B. Clarke, *Trans, Geo. Soc.*, ser. 2, vol. v., p. 371.

		Thickness.	Depth.
		Ft.	Ft.
Earth [soil]		2	2
Red gravel		4	6
London Clay.	Yellow clay growing darker [lower down ?]	20	26
	Blue clay with selenite	97	123
	Black earth	3	126
	(*a*) Chalk	50	178
	(*a*) Upper green sand, greenish sand, and blackish earth	4	180

(*a*) ? Can these two beds belong to the Reading Series. "Chalk" being marly clay, and the "green sand" bottom-bed; it cannot of course be Upper Greensand.

3. The New Rectory, January, 1905.

Made and communicated by Messrs. Duke and Ockenden.

Water-level 75 feet down, reduced to 81½ when pumping. Yield, 720 gallons an hour.

		Thickness.	Depth.
		Ft.	Ft.
[London Clay]	Blue clay	41	41
	Rock	1	42
	Rock and clay	8	50
	Clay and sand	14	64
	Clay	24	88
[Reading Beds, 41 feet.]	Greensand	17	105
	Sand and clay	3	108
	Dark blue clay	21	129
Chalk		96	225

4. For Mr. A. D. Halford.

Made and communicated by Mr. F. Bennett, of Ipswich.

Old well 40 feet, deepened to 100. Intended to make it deeper, but stopped by running sand, about a foot thick, at that depth (20 feet of iron-cylinders at the bottom). A bore, of 4 inches diameter, put down by Messrs. Owen (about 1892), to the depth of 242 feet.

Water stands about 95 feet down. Supply of good quality, about 1,600 gallons an hour.

In the old well clay is said to have been met with a few feet down, and continued, of various colours.

		Thickness.	Depth.
		Ft.	Ft.
Old well		—	40
London Clay.	Light-coloured clay	20	60
	Dark clay	54	114
	Sandy loam [? basement-bed]	9	123
Reading Beds.	Stiff clay	2	125
	Clay	41	166
Chalk		158½	324½

This section gives more exact information than the two very old ones given above.

5. About 500 yards from Mr. A. D. Halford's well (above). 1903.
Made and communicated by Mr. F. Bennett, of Ipswich.

Shaft 68 feet with concrete-bottom, the rest bored. Tubed from 66 feet to 184 feet 10 inches down.

Water stands in tube about 110 feet down.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[London Clay]	Dark clay	68	0	68	0
	Stiff London clay	5	0	73	0
	Brown rock	1	4	74	4
	London clay	1	2	75	6
	Rock	1	0	76	6
	London clay	6	3	82	9
	Rock (very hard)	1	6	84	3
	London clay	22	3	106	6
	Dark sand-loam	2	6	109	0
	Sand-pan	0	6	109	6
	London clay	3	6	113	0
[Reading Beds, 57 feet.]	Dark running sand	3	6	116	6
	Stiff mottled clay	4	0	120	6
	Light-coloured running sand	1	6	122	0
	Sandstone	1	4	123	4
	Light-coloured running sand	2	8	126	0
	Light-green running sand	11	0	137	0
	Dark brown clay	1	6	138	6
	Coarse grey sand about the size of small shot	6	0	144	6
	Dark loam	5	6	150	0
	London clay	12	6	162	6
	Brown clay	3	6	166	0
	Green loam	4	0	170	0
[Upper Chalk]	Flint bed, mixed with chalk	1	6	171	6
	Chalk, with flints at 208 and 223 feet down	88	6	260	0

Easton Park. About a quarter of a mile N.E. of the house.
(Ordn. Map 191, N.S.; Geol. Map 50 S.E.)
Information from Mr. D. Smith (Letter, December, 1875).

		Thickness.	Depth.
		Ft.	Ft.
Old well [? 1845] gave good supply at about 65 feet		—	65
Bored in 1873	Very coarse stony sand at about	30	95
	Firm sand ,,	5	100
	Chalk ,,	400 to 500	550

The old well was probably mostly in Boulder Clay.

The following further particulars are from a letter from Mr. Smith to Mr. S. V. Wood, Junr., dated April, 1874. The sinking went through a considerable thickness of clay into sand, with a good deal of iron. Bored in sandy material, with slight traces of Crag.

Edwardston.

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)

1. The Hall.

Sunk and communicated from memory by Mr. TRICKER, as also were the two following.

Loam - -	10	64 feet.
Black clay- -	40	
Sand and gravel	14	

2. At the Lodge the section was the same.

3. Quick's Farm.

Chalky [Boulder] clay	20	64 feet.
Black clay - -	40	
Sand and gravel -	4	

4. Mill Green, east of the church.

Sunk and communicated (from memory) by Mr. KINGSBURY, of Boxford.

Boulder clay -	20	44 feet.
Sand and gravel	24	

Eleigh, *see* Monk's Eleigh.

Elmsett.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

1. THE MILL.

Sunk and communicated by Messrs. BENNETT, of Ipswich. (About 230 feet above Ordnance Datum. Water level about 125 feet above Ordnance Datum. Rev. E. HILL.)

	Thickness.	Depth.
	Ft.	Ft.
Old well, the rest bored - - - - - - - -	—	60
Clay and marl - - - - - - - -	24	84
Fine sand (with water, which brought in sand and choked the boring. Rev. E. HILL.) - - -	47½	131½
Loam and flints - - - - - - - -	1½	133
Chalk - - - - - - - - - -	59	192

2. No precise locality.

Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 380 (1840).

Diluvial [Boulder] clay	10	56 feet
Sand - - - -	46	

3. POPLAR HALL. Half a mile W. of ELMSETT GREEN.

Sunk and communicated (from memory) by Mr. TRICKER, of Edwardston.

Chalky [Boulder] clay	30	79 feet
Chalk - - -	49	

Elmswell.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

1. Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 375 (1840).

Diluvial [Boulder] clay	40 to 60 feet
Sand - - -	20 to 30 ,,

2. Another well. Same authority.

[Drift]	White clay - -	10	93 feet.
	Gravel - -	10	
	White clay - -	10	
	Blue clay with ironstone	20	
	Blue clay - -	43	

3. Ashfield Lodge.

Made and communicated by Messrs. Margrett and Allsebrooke, of Reading.

217 feet above Ordnance Datum.

Shaft 96 feet, the rest bored and lined with steel tubing.

Water-level (in the boring) 92½ feet down. Abundance of good water.

		Thickness.	Depth.
		Ft.	Ft.
Soil with surface water		20	20
Boulder clay		46	66
Sand		30	96
Very fine grey sand (dirty) with very little water		27	123
Yellow clay		2	125
Coarse sand with black [flint] pebbles		1½	126½
Layer of green-coated flints		½	127
[Upper Chalk]	Pasty chalk	5½	132½
	Hard chalk	18½	151
	Layer of flints and chalk with abundant water	9½	160½

Euston (At the north-eastern corner of the Hall).

(Ordn. Map 174, N.S.; Geol. Map 50 N.W.)

Made and communicated by Messrs. Le Grand and Sutcliff.

Water level 11 feet down. Good supply. Able to pump at the rate of 2,700 gallons an hour, with the suction only 15 inches in the water.

		Thickness.	Depth.
		Ft.	Ft.
Soil		5	5
[Glacial Drift]	Loam	1	6
	Brown sand	2½	8½
	Ballast [gravel]	11	19½
	Chalky clay	5	24½
	Clay and chalk	6½	31
	Clay and stones	48	79
	Sand. Blowing at top, but ceased after the first few feet	26	105
	Blowing sand, fine	18	123
	Blowing sand, coarser	5½	128½
	Clay and stones	1½	130
	Fine sand. A few small stones and small pieces of chalk	6	136
	Blowing sand, coarser from 187 to 216 feet. With gravel from 192 to 194 feet	80	216
	Large [coarse] ballast	8	224

This great thickness of Drift was unexpected here, where, indeed, no Drift is shown on the map. The foreman thinks that chalk flints were touched at the last.

Eye.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

1. Mr. Barns, Draper.

[Boulder] Clay	45	55 feet.
Sand	10	

2. Brewery Road.

Sand, 12 feet.

3. Between Broom Park Farm and The Gate House.

[Boulder] Clay, to Sand, 48 feet.

4. "Causeway," south-eastward of the town.

Water rose 8 feet

[Boulder] Clay	20	36 feet.
Sand	10	
Clay	4	
Sand	2	

5. Cherry Tree Inn.

[Boulder] Clay, to Sand, 45 feet.

6. The Church.

[Boulder] Clay	12	14 feet.
Sand	2	

7. Church Street.

[Boulder] Clay	40	50 feet.
Sand	10	

8. Cranley Hall.

Water rose 3 feet.

[Boulder] Clay	30	65 feet.
Sand and gravel	35	

9. Eye Park.

[Boulder] Clay	50	53 feet.
Sand	3	

All the above wells at Eye made and communicated by Mr. G. Day.

10. The Flax Works.

Water rose to surface.

Sandy Clay, to white clay [Boulder Clay], 20 feet.

11. Mr. Gedney's, west of Moor Hall.

[Boulder] Clay	35	40 feet.
Sand	5	

12. The Grammar School.

[Boulder] Clay	20	22 feet.
Sand	2	

13. Langton Green.

[Boulder] Clay, 45 feet.

14. MELLIS ROAD (Mr. Wood's Mill).
[Boulder] Clay, to Land-spring, 30 feet.

15. PIE HALL.
Sand, 12 feet.

16. RAILWAY STATION.

[Boulder] Clay	15	25 feet.
Sand	10	

17. BREWERY. 1887.
Made and communicated by Messrs. LE GRAND and SUTCLIFF
Water-level 10 feet down.

		Thickness.	Depth.
		Ft.	Ft.
[Drift]	Sand, clay and stones	14	14
	Blue clay	7	21
	Sand and stone	2	23
	White blowing sand	$10\frac{3}{4}$	$33\frac{3}{4}$
	Gravel and sand	1	$34\frac{3}{4}$
	Grey sand and clay	1	$35\frac{3}{4}$
	Grey blowing sand	$6\frac{1}{4}$	42
	Grey blowing sand and small stones	8	50
[? Crag, or Drift]	Green sand and clay	$\frac{1}{3}$	$50\frac{1}{3}$
	Grey blowing sand	$12\frac{2}{3}$	63
	Green sand and clay	19	82
	Green blowing sand and shells	6	88
	Flints	1	89
Chalk and flints		111	200

An older well at the brewery is given, by Mr. DAY, as sand, 15 feet.

Felixstow.

(Ordn. Map 225, N.S.; Geol. Map 48 N.E.; 6 in. Map 90.)
1, 2. Opposite the Railway Station. 1883 ?
Borings made and communicated by Messrs. BENNETT, of Ipswich.
No. 1. No water got.

		Thickness.	Depth.
		Ft.	Ft.
Soil, mould, &c.		10	10
[London Clay]	Clay	18	28
	Dark loam	2	30
	Clay	6	36
	Dark loam	1	37
	Septaria	over 1	38
	Clay [? partly clay of the Reading Beds]	31	69
[Reading Beds]	Dark sandy loam	$1\frac{1}{2}$	$70\frac{1}{2}$
	Light-coloured clay	$3\frac{1}{2}$	74
	Mottled clay	$9\frac{1}{2}$	$83\frac{1}{2}$
	Light-coloured sandy loam	$8\frac{1}{2}$	92

No. 2. Not more than 50 yards from No. 1. Water got from the sand, enough to supply a 4-inch pump, with 2-inch iron suction-pipe, which was kept at work for some hours.

		Thickness.	Depth.
		Ft.	Ft.
Soil		7	7
London Clay [and clay of the Reading Beds]		55	62
[Reading Beds]	Dark sandy loam	3½	65½
	Mottled clay	2½	68
	Light-coloured sand	1	69

3, 4. Messrs. Bugg and Jolley. At the foot of the cliff between Bent Hill and the Bath Hotel. 1885.

Sunk and communicated by Messrs. Bennett, of Ipswich.

Shaft, 28 feet, the rest bored.

A good supply of good water.

			Thickness.		Depth.	
			Ft.	in.	Ft.	in.
[London Clay, 64½ feet]	Clay with septaria at four levels		56	7	56	7
	[Basement Bed.]	Running sand	2	4	58	11
		Loam and flints [? pebbles]	5	0	63	11
		Rock	0	6	64	5
[Reading Beds, 43½ feet.]	Mottled clay		7	0	71	5
	Light sandy loam		8	0	79	5
	Mottled clay		2	0	81	5
	Light sandy loam		3	0	84	5
	Mottled clay		6	0	90	5
	Light sandy loam		7	0	97	5
	Slate-coloured clay		3	6	100	11
	Mottled clay		3	0	103	11
	Grey clay		1	0	104	11
	Mottled clay		1	6	106	5
	Flints		?1	7	108	0
Chalk. Flints were met with at 39 levels, between 440 and 500 feet			392	0	500	0

Second well. 1887. Deepened 1890. (Now the Waterworks), Felix Road.

About 60 feet above the first well, 850 feet from Felixstow House, 2250 from Wadgate Farm and 1300 from High Water mark.

Made and communicated by Mr. F. Bennett, of Ipswich.

Shaft 52½ feet, small sinking, 5½, the rest bored, and a tube driven down into the Chalk.

Water stands in the tube 61½ feet down.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Clay [soil, &c.]		2	0	2	0
Sand and crag [Red Crag]		17	0	19	0
[London Clay, about 83½ feet]	Blue clay with rocks [septaria] at 83½ to 84½ feet, and at 89 feet to 89 feet 7 inches	82	1	101	1
	Dark loam [basement-bed]	1	6	102	7
[Reading Beds, about 53 feet.]	Light-coloured stiff clay	6	0	108	7
	Mottled clay	11	0	119	7
	Very hard rocks (sandstone)	1	9	121	4
	Sandy loam	6	0	127	4
	Mottled clay	6	6	133	10
	Running sand	12	6	146	4
	Sand, clay and loam	2	0	148	4
	Mottled loam	3	6	151	10
	Dark brown clay	2	6	154	4
	Mottled clay	1	4	155	8
Chalk.	Flint and chalk	1	0	156	8
	Chalk	343	4	500	0

Possibly the London Clay should be carried a bed lower, in which case this section would agree better with the older one.

There was some trouble in sinking the brick shaft, owing to the great amount of water met with, beginning at the depth of about 14 feet.

WATERWORKS, *see also* **Trimley.**

Felsham.

(Ordn. Map 189, N.S.; Geol. Map 50 S.W.)

1. UPPER GREEN. 1892.

Communicated by the Rev. E. HILL.

278 feet above Ordnance Datum.

Sunk 120 feet; the rest bored. Water level, 150 feet down.

		Thickness.	Depth.
		Ft.	Ft.
[? All Glacial Drift]	Dark purple boulder clay	100	100
	Brown boulder clay	about 1	101
	Dark purple boulder clay	28	129
	Sand (fine whitish laminated sandy clay) Hard stone	6½	135½

Foul air was found in the boring; it bubbled up and extinguished candles.

2. For Miss Anderson. 1904 ?

Boring made and communicated by Mr. F. Bennett. Good supply.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Well [? old, ? in Boulder Clay]		–	–	100	0
[? Boulder Clay.]	Blue marly clay, with flints	18	6	118	6
[? All Glacial Drift]	Dark rough ballast [gravel]	1	6	120	0
	Loamy sand	2	6	122	6
	Stiff mottled loam	0	4	122	10
	Sandstone	1	4	124	2
	Coarse grey sand	4	4	128	6
	Light-green sand	6	0	134	6
	Coarse dark sand	0	9	135	3
	Light-coloured running sand	10	0	145	3
	Hard gravel-pan	3	6	148	9
	Flint bed	1	3	150	0
Chalk.	At first rather dark and soft, then good [firm ?]. Flints at 161 feet, 168½, 189, 195½, 197, 204½, 207, 213, 215½, 216½, 220, 222½, 223½, 225, 226, 228½, 230, 233, 234	84	9	234	9

Finborough, *see* Great Finborough.

Finningham (Railway Station).

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

Sunk and communicated by Mr. W. Warren.

Sand	2	58 feet
[Boulder clay]	56	

Flempton.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

1. In the village.

From Mr. W. Warren.

Black sand, 25 feet.

2. Brickyard, a mile South of the Church.

From information on the spot. F. J. Bennett.

[Glacial Drift]	[Boulder] Clay	8	18 feet.
	Loam	8	
	Gravel (To chalk and water)	2	

Flixton.

(Ordn. Map 176, N.S.; Geol. Map 66 S.E.)

In the *Suffolk Chronicle* of March 6, 1875, it is recorded that a man was killed by foul air in sinking a well at Mr Harris' (farmer). A lighted candle had been extinguished by the foul air, at the depth of 20 feet two days before. The well is about 75 feet deep.

Flowton.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 380 (1840).

Diluvial clay	90	94 feet
Chalk	4	

At Flowton Hall, clay 94 feet (same authority).

Framlingham.

(Ordn. Map 191, N.S.; Geol. Map, 50 S.E.)

1. Albert College, 1875.

About 150 feet above the level of the sea.
From information from workmen on the spot. W. H. Dalton.
Old well 68 feet. Bad water soaks through brickwork at 40 feet [indicating the base of the Boulder Clay]. Bored below this. Water rose at first to 50 feet from the surface; in 1879 it had fallen to 58 feet.

		Thickness.	Depth.
		Ft.	Ft.
Old well	Boulder clay - - - - 40 ?	68	68
	Sand, etc. - - - - - 28 ?		
Grey, pebbly, very sharp sand, full of impure water		27	95
Chalk - - - - - - - - - - -		135	230

2. Near Crown-and-Anchor Inn. 3. In Double Street.
4. Near Railway Station.
Information from Mr. J. Barker.

	2.	3.	4.
Boulder Clay	40	50	25 feet.
	to sand		to gravel.

5. An old well, without precise locality, given by Rev. W. B. Clarke. *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377 (1840).

Diluvial [Boulder] Clay, full of septaria and [derived] fossils	15	40 feet.
Sand - - - - - - - - - - - - - -	25	

Framsden (Brickyard N. of Helmingham Park, for Lord Tollemache).

(Ordn. Map 190, N.S.; Geol. Map 50 S.E.)
Sunk and communicated by Messrs. Bennett, of Ipswich.
Water rises to within 23 feet of the surface; supply good.

		Thickness.	Depth.
		Ft.	Ft.
Mixed soil - - - - - - - - -		7	7
[Drift 104 feet.]	Gravel - - - - - - -	1	8
	Boulder Clay - - - - - -	21	29
	Chalk stone or marl - - - -	1½	30½
	Light-coloured sand - - - -	½	31
	Boulder Clay - - - - - -	71	102
	Brown loamy clay - - - -	2½	104½
	Light-coloured running or blowing sand - - - - - - -	6	110½
	Black flints - - - - - -	½	111
Chalk - - - - - - - - - -		99	210

Fressingfield.

(Ordn. Map 175, N.S. ; Geol. Map 50 N.E.)

1. Jubilee Well, at the cross-roads southward of the Church, 1887, etc.

Communicated by the Rev. I. I. Raven, who says: "No account of the strata was kept at the time, but the following is approximately true." (1902.)

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift.]	Boulder Clay, with the usual chalk lumps, Belemnites, etc. - - -	31	31
	Sands and gravels - - - - -	3	34
	Clay - - - - - - - - -	35	69
	Sands and gravels considerably impregnated with iron - - -	3	72
[Drift and Crag ?]	Water impregnated with iron, at 76 feet, of late stated to be contaminated by organic matter. Beds not stated, but at this depth passed into a sand, bluish-greyish-greenish-drabbish, with only two small shells in 200 feet, and no water - - - -	204	276
Chalk.	Mere slush as it came up. No water down to 298 feet.		

Another account, apparently of the same well, is as follows :—

Water-level 74 feet down. Supply poor, about 2 gallons a minute at 20 feet below the level above given. Water from the Chalk not of very good quality, but considered to be good for domestic purposes.

		Thickness.	Depth.
		Ft.	Ft.
Old well (? the rest bored) - - -		—	76
[Drift and Crag.]	Fine sand - - - - - -	70	146
	Clay - - - - - - - -	½	146½
	Silty clay - - - - - -	5	151½
	Light-coloured clay and sand -	70½	222
	Green sand and shells - - -	30	252
	Green sand - - - - - -	24	276
Chalk - - - - - - - - -		110	386

2. Angel Inn, eastward of the church.

Communicated by the Rev. I. I. Raven.

[Glacial Drift] { Boulder Clay about 10 / Sand „ 36 } 46 feet.

Fritton (The Rectory).

(Ordn. Map 162, N.S.; Geol. Map 67 S.W.)

[Glacial Drift.] Silt, sand, and a little gravel, to water, 28 feet.

Frostenden (Cottage about a quarter of a mile N. of Blomfield Brickyard, or S.W. of the church, 1879).

(Ordn. Map 176 N.S.; Geol. Map 49 N.W.)
From information at the spot.

[Boulder Clay]	Stony clay (mostly)	about 56	66 feet.
	Clean clay - -		
Sand - - - - - -		,, 10	

Gazeley (Mill. From Mr. W. Warren).

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)
In Chalk 200 feet.

Gisleham (Grange Farm, 1904).

(Geol. Map 67 S.; Ordn. Map 176 N.S.)
Made and communicated by Mr. C. R. Cole, of Lowestoft.
Water-level 41 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Soil - - - - - - - -		2½	2½
[Boulder Clay.]	Hard blue clay - -	16½	19
	Loam - - - -	2	21
[Glacial Gravel.]	Yellow sand - - -	16	37
	Sharp sand and gravel	9	46

Gislingham.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

1. Parsonage.

Rev. W. B. Clarke, *Trans. Geol. Soc*, ser, 2, vol. v., p. 377 (1840).

		Thickness.	Depth.
		Ft.	Ft.
[Drift]	White clay - -	10	10
	Gravel - - -	4	14
	Blue clay - -	10	24
	Black sand - -	5	29
	Blue plastic clay -	20	49
	White sand -	16	65
	Gravel to water -	40	105

2. Another well. Same authority, p. 376.

Diluvial clay	60	75 feet.
Sand - -	15	

Glemham, *see* Great Glemham.

Glemsford.

(Ordn. Map 206, N,S.; Geol. Map. 51 S.E.)

1. Hunt Hill, opposite chapel. For public supply.

Information got by Mr. A. J. Jukes-Browne from the well-sinker.

Deepened in 1898 (further particulars, W. W.).

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift.]	[Boulder] clay - -	80	80
	Clayey loam (brickearth)	15	95
	Sand - - - - -	25	120
	? Sand or gravel - -	30	150
Chalk - - - - - - -		70	220

2. Messrs. Holdsworth and Co., 1888.

Communicated by Mr. S. C. Homersham.

Shaft 30 feet; the rest bored. Supply got. Water-level 72 feet down.

Abandoned.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift]	Blue clay and stones [Boulder Clay]	119¾	119¾
	Sand - - - - - - -	¼	120
Chalk and flints - - - - - - - -		30	150

3. Kolle's Horsehair Factory, South-westward of St. Mary's Church.

From information on the spot.

About 236 feet above Ordnance Datum.

110 feet deep, into gravel. Supply got.

4 Kolle's Malting Works. On the eastern side of the Village, W. of Court Farm. 1876?

From information on the spot.

About 100 feet deep. Always plenty of water (March, 1900).

5. About 100 yards N.E. of the Railway Station. For the Rural District Council. 1904.

Made and communicated by Messrs. Le Grand and Sutcliff.

123 feet above Ordnance Datum.

Water, from the Chalk, rose to 2 feet above the surface. It flowed, at the surface, at the rate of 30 gallons a minute. The yield, with the pump reaching 5 feet below the surface, was 80 gallons a minute.

			Thickness.	Depth.
			Ft.	Ft.
Soil and stones			3	3
Apparently all Glacial Drift.	[Gravel and Sand] with a little water.	Rough ballast	3	6
		Sandy ,,	2	8
		Rough ,,	1	9
		Ballast	5	14
		Blue sandy clay	1	15
		Brown gravel and little clay	4	19
		Boulder clay	14	33
		Sand	2	35
		Ballast	16	51
	[Boulder Clay, 218 feet]	Boulder clay (clay, flints, stones, etc.)	169	220
		Sandy boulder clay	7	227
		Boulder clay and stones	10	237
		Sandy clay and stones	32	269
		Clayey sand	11	280
		Hard sand	5	285
		Sand, in hard and soft layers	7	292
		Brown, clayey sand	13	305
		Hard sand with a little gravel at the base	18	323
		Live sand, coarse at the base	57	380
		Sand and flints	47	427
		Gravel and sand	2	429
		Blowing sand and flints	5	434
		Gravel and sand	1	435
		Blowing sand	8	443
		Blowing sand and flints	27	470
Chalk		Chalk and flints	1	471
		Chalk (no flints)	39	520

The greatest thickness of Drift yet recorded in the Eastern Counties, showing a very deep channel in the valley of the Stour. The 218 feet of Boulder Clay, beneath the 51 feet of gravel and sand, is unexampled, that gravel and sand being below the great sheet of Boulder Clay, which comes on over the higher ground just north. I believe that it is the greatest thickness of Drift recorded in the kingdom, and this is the more surprising, because the section begins at some depth below the great mass of Boulder Clay.

It is possible that Middle Chalk may have been reached ; but no specimen good enough for identification has been found. The top of the Chalk is 348 feet below Ordnance Datum, and in the neighbourhood the Chalk occurs at levels considerably above Ordnance Datum.

Gosling Green, *see* Groton.

Great Barton.

(Ordn. Map 189, N.S.; Geol. Maps 50, N.W. and S.W.)

1, 2, 3, sunk and communicated by Mr. W. WARREN.

1. The Rectory. Chalk, 90 feet.

2. Near the Mere. Brickearth, 25 feet.

3. The Bunbury Arms.

Gravel,	20	70 feet.
Chalk,	50	

4 By a small house ¾ mile S.W. of the church, and S. of the railway Information got by J. H. BLAKE.

Chalky Boulder Clay -	40	100 feet.
Chalk, to water - -	60	

Great Blakenham.

(Ordn. Map 207, N.S.; Geol. Map 50, S.W.)
Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2., vol. v., p. 379 (1840).

[Drift.]	Gravel - -	10	142 feet.
	Clay - -	40	
Chalk, no flints - -		92	

Great Bricett (RECTORY).

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)
Sunk and communicated by Mr. WHELLUM, of Raydon.

	Thickness.	Depth.
	Ft.	Ft.
Boulder Clay - - -	100	100
Dark green clay (? sandy)	10	110
Coarse sand and pebbles	12	122
Running shingle - -	10	132
Fine blue [wet] sand -	13	145

According to Mr. G. S. ELLISTON (Fourth Ann Rep. . . . of the Bosmere and Claydon Rural Sanitary District, 1878), good water is reached at the bottom.

Great Finborough.

(Ordn. Map 190, N.S.; Geol. Map 50, S.W.)
Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 378 (1840).

Clay - -	90	120 feet.
Sand, to water	30	

Great Glemham.

(Ordn. Map 191, N.S.; Geol. Map 50, S.E.)

Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377.

Diluvial [Boulder] Clay	20	40 feet.
Sand - - - -	20	

Great Redisham (Redisham Hall, 1904).

(Ordn. Map 176, N.S.; Geol. Map 50 N.E.)
Made and communicated by Mr. C. R. Cole, of Lowestoft.
Water-level 51 feet down.

			Thickness.	Depth.
			Ft.	Ft.
[Glacial Drift and Pebbly Series ?]	Loose soil - - - - -		12	12
	Sand - - - -	? over	12	24
	Brickearth - - -	about	5	29
	Loose gravel and water	,,	10	39
	Brickearth - - -	,,	5	44
	Coarse sand and gravel	? over	11	55

The total depth given as 56 feet.

Great Saxham.

1, 2, 5, from Mr. W. Warren. 3, 4, from Mr. Prewer.
(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

	Boulder Clay.	Chalk.
	Ft.	Ft.
1. Cobbs Hall - - - - - - -	30	70
2. Near Cobbs Hall - - - - - -	30	140
3. Cottage near Rectory - - - - -	4	50
4. Rectory - - - - - - - -	60 to	land-spring
5. White House, on high road, N. of Railway.	20 ,,	,, ,,

Great Thurlow.

(Ordn. Map 205, N.S.; Geol. Map 51 S.E.)

1. Church Farm.

Communicated by Messrs. Sedgewick and Weall.

Shaft 66 feet, the rest bored. No water.

Boulder Clay. At 128–132 feet chalk passed through [? boulder]. 134 feet.

2. Peppar Hall Cottages, 1882.

Communicated by Mr. J. Weall, of Watford.
Shaft 66 feet; bored 50 feet (1881). Larger bore made afterwards
Water rose 7 feet in the shaft. Good supply.

Boulder Clay 146 }
Chalk - - 52 } 198 feet.

3. Rectory. [? Vicarage.]

From Mr. W. Warren.
Boulder Clay, to sand and water, 80 feet.

Great Waldingfield.

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)

Communicated by Dr. J. S. Holden, of Sudbury. (1877.)

Boulder Clay - - - - - - - - -	25	35½ feet.
Sand - - - - - - - - - - -	½	
Shell-mud, with *Bithinia tentaculata, Cyclas, Limnæa peregra, Planorbis albus,* and other shells, besides fragments of wood; plenty of water - - -	10	

There is some doubt as to the clay being Boulder Clay, from the occurrence beneath of a freshwater bed unlike anything known to occur beneath that clay in the district, but like what might be found above it. Perhaps there may have been some mistake in the information given to Dr. Holden.

Another well, 400 or 500 yards off, is in Chalk at a depth of 35 feet.

Great Wratting.

(Ordn. Map 205, N.S.; Geol. Map 51 S.E.)

1. Bell Inn. About 1850.

Communicated by Mr. J. Weall.

Shaft 144 feet, the rest bored.

Boulder Clay, to Chalk, with plentiful supply of water, 181 feet.

2. Rook Trees Farm, about 150 yards from the Bell Inn. 1882.

Communicated by Mr. J. Weall.

Water rose (from the Chalk) 37 feet into the shaft. Plentiful supply.

Shaft, in Boulder Clay	72	189 feet.
Bore, in Chalk - -	117	

Groton.

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)

1. Castling's Heath.

Sunk and communicated by Mr. Kingsbury, of Boxford.

Boulder Clay	100	120 feet.
Chalk, to water	20	

2. Gosling Green.

Sunk and communicated (from memory) by Mr. Tricker, as also the following two:—

Boulder Clay -	20	64 Feet.
Black clay -	20	
Sand and gravel	24	

3. Gosling's (? Castling's) Heath or Gosling Green ?.

Stiff yellow loam - -	40	66 feet.
Red sand - - -	10	
White sand - - -	10	
Pebbly sand, with water	6	

4. Groton Place.

Boulder Clay -	30	42 feet.
Sand and gravel	12	

Hadleigh.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

1, 2. Two Wells. 1827.

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 372 (1840)

	On a Level with the River.	
	Ft.	Ft.
Gravel - -	12	—
Blue clay -	90	70
Chalk - -	28	30
	130	100

3. Railway Station.

Sunk and communicated (from memory) by Mr. Pettit, of Hadleigh, as also are the following two sections.
Water rose 4 feet.

Sandy loam - - - -	12	37 feet.
Boulder Clay - - - -	8	
Dark green clayey sand - -	13	
Blowing sand and pebbles -	4	

4. Frog Hall, E. of the town

Boulder Clay - - - - -	14	54 feet.
Sand and gravel - - - -	8	
Fine white sand (not bottomed) -	32	

5. Coram Street, about a mile westward of the town.

Boulder Clay..	35	To black pebbles and water, 47 feet.
Sand - -	12	

6. Pond Hall, in straw-yard, 1¼ miles S. of E. of the Railway Station.

Information got by Mr. F. J. Bennett.
Gravel, to water, always tepid, 16 feet.

7. Mr T. Wilson's Maltings. Since 1895.

Bored and communicated by Messrs. Le Grand and Sutcliff.
Water-level 78 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Well (the rest bored)		—	48
[? All Reading Beds.]	Brown sand	7	55
	Blue clay	5	60
	Green sand	7	67
	Light-blue clay	4	71
	Coarse brown sand	4	75
	Coarse grey sand	5	80
	Blue clay	1	81
	Sandy blue clay	7	88
	Loamy sandy clay	2	90
	Mixture, sandy clay	4	94
	Mixture, green sands	4	98
	Flints	2	100
[Upper Chalk.]	Chalk (no flint)	140	240
	Chalk and flint	58	298

8. Messrs. Woods & Co. Since 1895.

Made and communicated by Messrs. Le Grand and Sutcliff.
90 feet above Ordnance Datum. Water-level 16 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Made earth		4	4
?All Drift.	Gravel and water	6	10
	Clay chalk and stone drift	2	12
	Yellow clay and chalk	4	16
	Blue clay and chalk	37	53
	Loamy sand and water	13	66
	Blue clay and chalk	24	90
Chalk.	Putty chalk	25	115
	Chalk	67	182
	Chalk and flints	38	220

This section seems to point to a channel of Drift.

Halesworth.

(Ordn. Map 176, N.S.; Geol. Map 50 N.E.)

"There is no public water service for any part of the town. The inhabitants obtain drinking-water from wells, which vary in depth from 10 feet to 60 feet, the latter depth being attained only in very rare instances. . . . A great number of wells have been condemned by the Authority, and others, though not condemned, are so notoriously unwholesome as to be shunned by the cottagers. In fact, in a large portion of the upper and best part of the town, the inhabitants are obliged, for drinking purposes, to resort to one single well . . . in the Market Place. This well appears to be some 40 feet deep." It is "less than 40 feet from the churchyard." The various sources of pollution are noticed. Dr. F. St. G. Mivart's Report to the Local Government Board, 1897, p. 8.

Hardwick.

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

1. Steward's House.

Information from Mr. Prewer.

Boulder Clay	4	80 feet.
Chalk	76	

2. The House. Information got by J. H. Blake.

Boulder Clay	30	160 feet.
Chalk, with water at the bottom	130	

3. Lodge, 3 furlongs N.E. of the House.

From information on the spot. J. H. Blake.

Glacial Drift.	Loam and gravel, with very large flints at the bottom	9	80 feet.
	White clay	3	
	Loam	3	
Chalk,	with water at the bottom	65	

4. An old Well. 1777.

Sir J. Cullum. "History of Hawstead," p. 230, 4to. *Lond.* 1784 (p. 262 of Ed. 2).

		Thickness.	Depth.
		Ft.	Ft.
Black mould		1 to 2	1½
[Glacial Drift.]	Yellowish compact tough loam, with nodules of chalk, flints, and stony concretions containing shells. One stone about 200 lbs. weight	13 to 14	15
	Bluish loam with Ammonites, Gryphæa, and Oyster-shells	2	17
	Loam of a ferruginous colour Sand Sandy loam	4	21
	Sharp yellow sand with Belemnites	4	25
	Coarse gravel with large flints	3	28
	Yellowish loam	1	29
	Deep-blue loam, very dry and tough, with large flints, a few small pieces of pyrites, and an Ammonite	6	35
	Pale blue loam, tough and dry, tinged with yellow, pieces of pyrites and of slate	14	49
Chalk, the crust very hard, the rest softer, interspersed with large flints. Between 112 and 18 feet down gas issued. At 129 feet, water		88	137

Hartest.

(Ordn. Map 206, N.S.; Geol. Map 50 S.E.)

1. Rev. W. B. Clarke. *Trans. Geol. Soc.*, ser. 2, vol. v., p. 375 (1840).

[Boulder Clay]	Whitish clay	3	303 feet.
	Blue clay to red sand	300	

The thickness given to the Boulder Clay seems excessive.

Information from Mr. W. Warren.

2. The Green. Boulder Clay, 40 feet.

3. Stow Hill. ,, ,, 150 feet. Water rose 90 feet.

Most of the wells here get their supply from springs in the Boulder Clay F. J. Bennett.

Hasketon.

(Ordn. Map 207, N.S.; Geol. Map 50 S.E.)
Cottage at the southern end of Blunt's Wood, on the edge of the map, ¼ mile N. of Lechford Hall (in 48, N.E.).
S. V. Wood, Junr. *Quart. Journ. Geol. Soc.*, vol. xxxiii., pp. 106, 107 (1877).

			Thickness.	Depth.
			Ft.	Ft.
Glacial Drift.	Boulder Clay		6	6
	Sand and gravel.	Coarse gravel	3	9
		Fine gravel, with fragments of marine shells, passing into the bed below	3	12
		Buff sand	45	57
Red Crag.	Crag with shells		6	63
	Crag with water		4	67

Haughley.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

1. Haughley Green (North of the Village).

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).
Diluvial [Boulder] Clay, 60 feet.

2. Plashwood (East of the Village).

From Col. J. Hasted.
Sand, to Chalk, 100 feet.

Havergate Island (Marshes east of Boyton).

(Ordn. Map 208, N.S.; Geol. Map 48 N.E.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 383.

London Clay.	Blue clay, with the usual rocky concretions [septaria]	80	100 feet.
	Rock, 2 inches [Basement-bed]		
Sand [Reading Beds]		20	

Haverhill (Waterworks, Camps Road, 1894).

(Ordn. Map, N.S., 206; Geol. Map 47.)
Nearly 297 feet above Ordnance Datum.
Made and communicated by Mr. G. Ingold.
Shaft, 103 feet; the rest bored. Water-level 73¾ feet down.
Yield exceeding 150 gallons a minute.

		Thickness.	Depth.
		Ft.	Ft.
Mould		3	3
[Drift.]	Brown sandy loam	2½	5½
	White boulder clay	11½	17
	Blue clay	6	23
	Blue and brown clay	2	25
	Chalk and clay	3	28
Upper Chalk, with flints, especially from 130 to 230 feet down		227	255

Helmingham Hall.

(Ordn. Map 190, N.S. ; Geol. Map 50 S.E.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377 (1840).

	Thickness.	Depth.
	Ft.	Ft.
Mould - - - - - - - -	1	1
Clay with [derivative] shells [Boulder Clay]	56	57
Chalk [? chalky Boulder Clay or gravel] -	30	87
Dark sand - - - - - - -	5	92

Hemingston.

(Ordn. Map 207, N.S. ; Geol. Map 50 S.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 379.

[Drift.]	Loam [London] clay - -	10	95 feet.
	Plastic clay, gravel, and sand	40	
Chalk - - - - - - - - -		45	

Hemley.

(Ordn. Map 208, N.S. ; Geol. Map 48 N.E.)

Rev. W. B. Clarke. *Trans. Geol. Soc.*, ser. 2, vol. v., p. 383.

Loamy soil	6	50 feet.
Crag -	44	

Hengrave (A mile south of Flempton Church).

(Ordn. Map 189, N.S. ; Geol. Map 51 N.E.)

From Mr. W. Warren.

Brickearth-	15	29 feet.
Chalk -	14	

Henham (The Hall).

(Ordn. Map 176, N.S. ; Geol. Map 49 N.W.)

Sunk and communicated by Mr. J. Dade, of Wrentham.

[Boulder] clay - - - - -	about 26 or 27	To water 61 feet.
Gravel and sand with a little Crag at the bottom -	? 35	

Henley.

(Ordn. Map 207, N.S. ; Geol. Map 50 S.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 379 (1840).

Clay - -	20	40 feet.
Gravel -	20	

Henstead (Mr. E. Raven's Farm).

(Ord. Map 176, N.S.; 6 in. Map 19 S.W.; Geol. Map 49 N.W.)

Communicated by Mr. R. H. I. Palgrave.

Water-level about 55 feet down.

[? All Glacial Drift.]	Blue [Boulder] Clay - - - -	30	59 feet.
	Bright sand and gravel, mixed - -	24	
	Grey sand, in which water was found -	5	

Hepworth (The Marlboro' Inn).

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

[Boulder] Clay	40	90 feet.
Chalk - -	50	

Herringswell.

In the village. From Mr. W. Warren.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

Black sand	5	25 feet.
Chalk -	20	

Hesset (The Church).

(Ordn. Map 189, N.S.; Geol. Map 50 S.W.)

Communicated by Mr. W. Warren.

Boulder Clay	30	60 feet.
Sand - -	30	

Hestly (The Hall).

(Geol. Map 50 N.W.)

Sunk and communicated by Mr. G. Day.

[Boulder] Clay	80	95 feet.
Sand - -	15	

Higham Hill, Mr. Harris.

(Ordn. Map 224, N.S.; Geol. Map 48 N.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 373 (1840).

[Drift and ? Crag]	Gravel - - - - - - -	10	40 feet.
	Sand - - - - - - -	20	
London Clay, to sand, with water strongly impregnated with sulphur, and useless - - - - - -		10	

Hinderclay.

(Ordn. Map 175, N.S.; Geol. Map 50 N.W.)

1. Public Supply. Boring ?

Communicated by Dr. F. Parsons.

About 150 feet above Ordnance Datum.

Water-level, 62 feet down. Supply, 200 gallons an hour.

Boulder Clay	40	202 feet.
Chalk -	102	

2. The Rectory.

[Boulder] Clay	40	60 feet.
Chalk	20	

Col. J. HASTED told me that there are wells here getting a good supply from the Chalk at the depth of 70 feet.

Hintlesham.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 380 (1840).

Diluvial [Boulder] Clay	15	36 feet.
Sand with gravel	21	

Hitcham.

(Ordn. Maps 206, 207, N.S.; Geol. Map 50 S.W.)

1–3. Communicated by the Rev. E. HILL, from information from Mr. E. S. COBBOLD, engineer.

1. *The Hall.* About 175 feet above Ordnance Datum. Well, 60 feet deep.

[Drift.] { Blue clay.
Brighter clay and marl.
Sand and consolidated flint-pebble-bed, from which the water comes.

A specimen from the new well here (from 45 feet deep) is a hardened clay or soft cement-stone with shells. There is said to be 2 feet of this, with shells and shingle.

2. *The Rectory.* About 235 feet above Ordnance Datum. Well 102 or 103 feet deep. At 100 feet a "fault" (so-called) of hard sand, from which the water comes. [Drift.]

3. *Squirrel's Farm.* Eastern end of parish. Well said to be 100 feet deep, all in [Boulder] Clay.

4. Messrs. LE GRAND and SUTCLIFF note a well here, 180 feet above Ordnance Datum, in which chalk was reached 125 feet down.

5. CROSS GREEN, for public supply.

Communicated by Messrs. LE GRAND and SUTCLIFF.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift.]	[Boulder Clay.] Clay flint and chalk stones	150	150
	[? Glacial gravel and sand] Red gravel	3	153
	Clean gravel and sand	30	183
	Blowing sand	50	233
	Dark grey sand	5	238
[Crag or Drift.]	Grey sand and shells, with a thin layer of flints at the bottom	18	250
Chalk and flints		44	300

This is another section showing a great and unexpected thickness of Drift (and perhaps some Crag) above the Chalk.

According to DR. PARSONS the water-level is 158½ feet down and the yield is 300 gallons an hour.

6. HITCHAM STREET. Boring for Public Water-Supply (Pump.) 1901. Communicated by Mr. E. S. COBBOLD. (Remarks in brackets from specimens.)

About 175 feet above Ordnance Datum.

		Thickness.	Depth
		Ft.	Ft.
Surface-material - - - - - - -		12	12
	Boulder clay - - - - -		
	Gravel and sand - - - -	18	30
	White sandy silt - - - -	15	45
	Pale greenish sand (specimen fine, buff)	15	60
	Dark mud, smelling like a ditch - -	5	65
	Dark sandy mud, varying in coarseness - - - - - - -	13	78
[? All Drift.]	Dark sand, with shell-fragments; occasional flint and other pebbles. A few perfect shells, waterworn (*Mya* ? at 87 feet; *Mya, Purpura, Tellina at* 97 feet) - - - -	20	98
	Dark sand, rather finer; no shells -	?2	100
	The like; few shell-fragments - -	?4	104

The shells are not suggestive of Crag; and the section, as the Rev. EDWIN HILL remarks (in a letter to me), "is interesting as revealing a buried valley."

A specimen from the "soft water well, against Hitcham church-gate" 12 feet deep an ! 9 inches thick is cemented Drift, conglomerate and sandstone.

Holton.

(Ordn. Map 224, N.S.; Geol. Map 48 N.W.)

Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 373 (1840).

1. The Hall. Diluvial [Boulder] clay and chalk stones, 40 feet.
2. Rectory „ „ „ „ 42 „

Horningsheath.

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

1. About 100 yards S.E. of the Church.

From information on the spot. J. H. BLAKE.

Boulder Clay, in which a vertebra of elephant was said to have been found.	Yellowish-white clay - -	15	26 feet.
	Dark blue clay, with chalk-stones and many boulders of various rocks - -	10	
Gravel, to water - - - - - - - - -		1	

	Boulder Clay.	Gravel.	Chalk.
	Ft.	Ft.	Ft.
2. Great Horringer Barn, nearly half a mile N.N.E. of the Hall - - - - -	—	40	110 (to water).
3. Great Horringer Hall - -	35	—	130
4. Half a mile west of Horringer Mill - - - - - -	4	—	75
5. Horringer, Six Bells - -	35	—	150
6. Little Horringer Hall - -	25	—	135

2. From information on the spot. J. H. Blake. 3–6, from Mr. Prewer. Besides these, Mr. Bennett has got sections, from Mr. Prewer, showing the following depths through Boulder Clay to water:—

7.	Horringer Lodge - - -	35	feet.
8.	,, Hopley's Cottage -	20	,,
9.	,, Old Rectory - -	27	,,
10.	,, Sharp Street - -	40	,,
11.	,, near the Six Bells -	30	,,

Hoxne.

(Ordn. Map 175, N.S.; Geol. Map 50 N.E.)

1–10, from Mr. Day.

1. Abbey (water rose 6 feet). 2. Infant-school (by church). 3. (water rose 6 feet) and 4. Pig Street. 5. By Church (water rose 3 feet). 6. Lower part of village.

		1.	2.	3.	4.	5.	6.
Glacial Drift	[Boulder] clay	45	50	50	18	35	—
	Sand, or -	10	15	10	—	—	20
	Gravel - -	—	—	—	6	15 (coarse)	—

7. Burnt House.

Water rose 6 feet.

		Thickness.	Depth.
		Ft.	Ft.
Glacial Drift	[Boulder] clay	26	26
	Gravel -	4	30
	[Boulder] clay	20	50
	Sand - -	4	54

8. Heckfield Green.

Glacial Drift	[Boulder] clay - -	40	70 feet.
	Loam and sand, in layers	10	
	Sand - - - -	20	

9. Lion Inn, Cross Street, near the Abbey (water rose 20 feet).
10. Timberyard and saw-mill (water rose 14 feet).

		9.	10.
Glacial Drift	[Boulder clay - - -	35	25
	Sand - - - -	10	5
	[Boulder] clay to gravel -	15	20

11. Oakley Park (W. of the Village). 1877 ?

Made and communicated by Messrs. Bennett, of Ipswich.

		Thickness.	Depth.
		Ft.	Ft.
Old well		—	32
Glacial Drift	Light-coloured clay	2	34
	Blue clay and sand	3	37
	Sharp shingle and sand, like beach	25	62
? Crag and Eocene ?	Light-green crag and sand	27	89
	Light-green clay	1	90
	Light-green crag and sand	39	129
	Light-green clay	7	136
	Flints	1½	137½
Chalk		31½	169

An account of the old well, from Mr. Day, gives the section thus :—Clay, 10 feet, gravel 5 and clay 7, or 10 feet less than the depth given above. There may be two wells.

12. Rectory. 1877.

Made and communicated by Messrs. Bennett, of Ipswich.

An account of the old well, got by Mr. F. J. Bennett from Mr. G. Barham, of Winfarthing, shows 39 feet of clay over sand, to the depth of 45 feet, or 5 less than marked below.

		Thickness.	Depth.
		Ft.	Ft.
Old well		—	50
[Boulder] clay and large flints. [Specimen of brownish sandy clay, with bits of stone, at 70 feet]		24	74
? Drift, ? Crag, and ? Eocene	Loose running sand and crag (red)	17	91
	Light-blue clay	1	92
	Loose running sand and crag [many specimens of *Purpura lapillus*]	60	152
	Light-coloured clay	9½	161½
	Flints	1½	163
Chalk		40	203

Hundon.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)

1. Hundon Mill. 1885.

Made and communicated by Mr. G. Ingold.
A little water at 10 feet.

Boulder Clay]	Brown clay	9	30 feet.
	Blue clay	21	

2 and 3 communicated by Mr. J. WEALL.

2. The Hall. Shaft of 70 feet, all in blue [Boulder] clay. An insufficient supply of water.

3. Thick's Farm. Shaft 80 feet, bored 50 feet, all in blue [Boulder] clay. No water.

These two were wrongly printed as Hemdon in the Memoir on "The Geology of the Country between and south of Bury St. Edmunds and Newmarket," 1886.

4. On high ground a mile N. of the village.
Communicated by Dr. F. PARSONS.
366 feet above Ordnance Datum.

Shaft 146 feet, the rest bored. Tubed 9 feet into the Chalk. Level of Chalk-water 137 feet down. Yield over 12,000 gallons an hour.

Boulder Clay - - -	178	246 feet
Chalk with flints - -	68	

Hunston.

(Ordn. Map 189, N.S.; Geol. Map 50 N.W.)

IN THE VILLAGE.

Sunk, and communicated by Mr. WARREN.
Sand 10 feet.

Huntingfield.

(Ordn. Map 191, N.S.; Geol. Map 50 N.E.)

"The village is supplied exclusively from wells which vary from 10 to 20 feet in depth."—Dr. F. St. G. MIVART's Report to the Local Government Board, 1897, p. 7.

Icklingham.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

BRICKYARD (Devereux's) marked on the map, more than a mile E.S.E. of All Saints Church. From Mr. WARREN.

Brickearth -	30	60 feet.
Chalk - -	30	

Ickworth.

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

1. ICKWORTH HOUSE.

REV. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).

Drift.	White clay -	12	28 feet.
	Pipe clay -	4	
	Gravel -	2	
	Blue clay -	10	

2. In the middle of the site of the new wing to Ickworth House. From information on the spot. Boring unsuccessful. J. H. BLAKE.
Chalky Boulder-clay, not bottomed, 96 feet.
3 and 4 from Mr. PREWER.

3. At Hall [? Old Hall]. Boulder Clay, to gravel and water, 60 feet.

4. Horsepool Lodge. Boulder Clay, to land-spring, 35 feet.

5. The Park.

Information got by J. H. Blake.

At Iron Gates water was found at the depth of 25 feet, and by the small cottage between the Monument and Martin's Green at 20 feet. The Old Hall was supplied by a spring about 4 feet down.

Ilketsall *see* St. John Ilketsall.

Ingham. Parsonage.

From Mr. Warren.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

[Boulder] Clay	50	90 feet.
Chalk - -	40	

Ipswich.

(Ordn. Map, 207 N.S.; Geol. Maps 48 N.E. and N.W.)

1. Messrs. Burton and Co.'s Jam Factory. 1905.

Made and communicated by Mr. F. Bennett.
Tubes, of 6 inches diameter, to the depth of 57 feet 10½ inches.
Good supply of water of first-class quality.

	Thickness.	Depth.
	Ft.	Ft.
Concrete floor - - - - - - - -	—	½
Made soil - - - - - - - - -	6	6½
[Drift] Ballast, rough- - - - - -	4	10½
[Drift] Ballast, rough, in water - - - -	23½	34
[Drift] Flint bed - - - - - - -	1	35
[Upper] Chalk, with a great number of layers of flints at the bottom part - - - - - -	240	275

2. Cliff Brewery, Messrs. Cobbold's.

Sunk and communicated by Messrs. Bennett, of Ipswich.

Water rises to nearly 13 feet below the surface at high water. Supply, 2 barrels a minute.

	Thickness.	Depth.
	Ft.	Ft.
Depth of old boring, just on to the Chalk - -	—	34
Chalk. No flints met with. At a depth of about 175 feet loose chalk, full of small nodules, was found, and a few feet lower a tougher chalk, like pipe-clay - - - - - - - - -	166	200

3. College Street. Messrs. Burton & Saunders, adjoining Messrs. Turner's Foundry.

Made and communicated by Mr. F. Bennett.

Measured from the basement-floor, which is about 6 feet below the street-level. 153 feet of tubes, of 6 inches internal diameter, were driven.

		Thickness.	Depth.
		Ft.	Ft.
Well		—	9
? All Drift.	Light-coloured running sand	9½	18½
	Light-coloured loam	30½	49
	Sand and hard chalk in lumps, or sort of stone	32	81
	Light-coloured loam	16½	97½
	Light-coloured running sand	2	99½
	Blue clay	2½	102
	Loam with flints	7½	109½
	Rough sand with chalky stones, as above	3	112½
	Stiff loam, with chalk and flint-stones	12½	125
[? Reading Beds.]	Sand	4	129
	Flint-bed	1	130
Chalk . Flints met with at 32 levels, from about 212 feet to the bottom		191½	321½

The interest of this section lies in its corroborating the evidence for a deep channel of Drift, given by the section at St. Peter's Quay, New Mill, showing a depth of 127 feet to the Chalk, whereas at Messrs. Turner's foundry (close by to the west) it is but 70 feet. All three show a considerable thickness of Drift, the top of the Chalk being lower than on the rather higher ground northward, as the section at Messrs. Pretty's Stay Factory, as well as the Geological Survey map, shows.

4. Eagle Malting. (Communicated by the Admiralty.)

Bore of 5 inches diameter. Lined 155 feet.
Water-level 11¾ feet down. After pumping, 14¾ feet.
Yield 1,500 gallons an hour, of good quality.

To Chalk 26 } 350 feet
Chalk - 324 }

5. Henley Road (highest part of Ipswich) for Mr. T. N. Fonnereau.

Sunk and communicated by Messrs. Bennett, of Ipswich.
Water-level, 125 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Depth of well [Drift, Crag, and London Clay, probably]		70	70
[London Clay]	London Clay	21	91
	Brown loam	8	99
[Reading Beds, 37½ feet.	Loamy sand [?Oldhaven Beds]	6	105
	Dry red sand	6	111
	Running sand	19	130
	* Dark greenish clay	5½	135½
	* Dark green clay, and flints	1	136½
Chalk		113½	250

* In this, and other sections, the green beds above the Chalk may belong to the Thanet Beds.

6. Messrs. Mason's Paper Mills between the river and the dock. 1890.

Made and communicated by Mr. F. Bennett.

Shaft 4 feet, the rest bored, and tubed to the depth of 272 feet.

A plentiful amount of water found between 180 and 230 feet down; but the water being salt it was shut out by tubing.

	Thickness.	Depth.
	Ft.	Ft.
Made soil - - - - - - - - - -	4	4
[Alluvium] Black ooze - - - - - - -	11	15
[River Gravel] Shingle and sand - - - - -	14	29
Chalk. The first lot of flints at the depth of 30 feet (with soft chalk below); the next at 233½, and then at 246, 248, 264, and 270, beneath which flints were found continuously - - - - - -	371	400

7. Orwell Works. Ransome, Sims & Co.

Sunk and communicated by Messrs. Bennett.

Cylinders 5 feet in diameter for 30 feet, the rest bored.

Water rose to within 11 feet of the surface. Good supply.

Made earth [? including alluvium or gravel about	30	173 feet.
Chalk - - - - - - - - - - - ,,	143	

Another well. 1904 ?

Made and communicated by Mr. F. Bennett.

Water stands 21 feet from ground-level.

		Thickness.	Depth.
		Ft.	Ft.
Made soil - - - - - - - -		2	2
[River Drift] Gravel and stone - -		3	5
[Reading Beds ?]	Brickearth - - - - -	8	13
	Blue clay - - - - -	1	14
	Light-coloured running sand	10	24
	Blue clay - - - - -	6	30
	Mottled clay - - - -	1½	31½
	Flint bed - - - - -	½	32
Chalk, bored into - - - - - -		119	151

8. Messrs. Pretty's Stay Factory, about 200 yards north of the Cornhill. Top level with the basement-floor. 1896.

Made and communicated by Mr. F. Bennett.

25 feet of cylinders, of 4½ feet diameter, to the depth of 31 feet 4¾ inches. Brickwork built on this for 6¾ feet in height. A tube, of 6 inches internal diameter, driven 16¼ feet into the Chalk.

A supply of 10,000 gallons an hour taken; 13,000 were got in the trial-pumping.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[? Drift.]	Red earth	12	6	12	6
[? Reading Beds.]	Running sand	4	0	16	6
	Mottled clay	11	6	28	0
	Green sand	3	6	31	6
	Mottled clay	0	8	32	2
	Light-coloured running sand	0	6	32	8
	Sand stone	1	10	34	6
	Running sand	10	0	44	6
	Blue clay	8	0	52	6
Chalk.	Chalk and flints	1	0	53	6
	Chalk	196	6	250	0

9. Messrs. Redwell's Highspeed Engine Works, about 400 yards N.W. of the Railway Station. 1899.

Made and communicated by Mr. F. Bennett.

Good supply of water, about 10,000 gallons an hour, from a tube of 7 inches internal diameter, driven 13 feet 8 inches into the chalk. Water-level about 11 feet down.

Ballast.	Stone and sharp sand	34	150 feet.
Chalk		116	

10. St. Peter's Iron Works (Messrs. Turner), by the water-side.

Sunk and communicated by Messrs. Bennett, of Ipswich.
Water rises to within 9 feet of the surface. Supply good.

		Thickness.	Depth.
		Ft.	Ft.
Depth of well [made ground and alluvium probably]		—	15
River Drift.	Shingle and sand	17⅔	32⅔
?Drift over 37 feet.]	Blue loamy sand	11⅓	44
	Sharp sand	4	48
	Sand and marl or chalk-stone	16	64
	Clay	6	70
Chalk		62	132

11. St. Peter's Quay, New Mill (Messrs. Cranfield's), just E. of the last. 1883.

Sunk and communicated by Messrs. Bennett, of Ipswich.
Shaft 11 feet, the rest bored.
An excellent supply of water, rising to about 8 feet from the surface.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Mixed soil [made ground, &c.]		11	0	11	0
[These beds seem to be Drift, which must fill a deep hollow in the Chalk here, that rock coming to a much higher level on all sides.]	Clean shingle	4	9	15	9
	Coarse loam and chalk-stones	1	7	17	4
	Loam	1	6	18	10
	Stiff light-coloured clay	6	0	24	10
	Red loam	1	6	26	4
	Very fine white loam	5	6	31	10
	Dark loam	10	3	42	1
	Clay	2	6	44	7
	Loam	13	3	57	10
	Fine loamy sand	12	6	70	4
	Clay	1	4	71	8
	Loamy sand, coarse for top 1½ feet, the rest finer	8	6	80	2
	Clay	1	0	81	2
	Dark loamy sand	18	10	100	0
	Boulder clay, stiff, of a light-slate-colour, full of chalk-stones and large flints	3	0	103	0
	Coarse light-coloured sand, and shells	4	6	107	6
	Fine light-coloured sand	3	6	111	0
	Shingle and sand	3	0	114	0
	Light-coloured loam	4	0	118	0
	Broken-up septaria (6 inches) and boulder clay (as above)	4	0	122	0
	Red loamy sand	1	0	123	0
	Light-coloured running sand	4	0	127	0
Chalk		81	0	208	0

Another boring, finished in May, 1905, 25 yards eastward of the above and 60 yards southward of St. Mary Key church.
Made and communicated by Mr. F. Bennett.
Tubes of 10 inches internal diameter driven to the depth of 135 feet.
Water stands in the tube 7½ feet down at high tide, 23 inches less at low water.

		Thickness.	Depth.
		Ft.	Ft.
Soil		9½	9½
[? All Drift]	Ooze sand	1½	11
	Coarse ballast [gravel]	10½	21½
	Light coloured loam	6½	28
	Dark loam	10	38
	Coarse ballast	10	48
	Coarse sand	8	56
	Clay	4¼	60¼
	Flint bed	¾	61
Chalk, the bottom 40 feet full of small flints		239	300

Although so near together there is a great difference in the depth to the Chalk in these two borings: an increase of 66 feet in a horizontal distance of only 75. This shows how irregularly the Drift lies on the Chalk in this waterside part of Ipswich, presumably in a channel.

12. Smart's Wharf, St. Mary Key. Messrs. Paul's. 1885 ?

Sunk and communicated by Messrs. Bennett. (Some further particulars in these brackets from Mr. T. Miller.)

Shaft, 11 feet, the rest bored.

Salt water came in through the upper soft part of the Chalk, so that tubes had to be driven to a depth of 117 feet. This effectually excluded the salt water, and a good supply of fresh water was got (at 150 feet and below), rising to within about 7 feet from the surface.

		Thickness.	Depth.
		Ft.	Ft.
Mixed soil (ooze, sand, peat and made soil) - -		11	11
[Drift, 29½ feet]	Coarse gravel [? River Gravel] -	15	26
	Boulder Clay (blue) - - -	12	38
	Gravel and sand - - - -	2½	40½
Chalk, the upper part very soft. (Pyrites nodules at the depth of 93 feet) - - - - - - -		148½	189

This well is within 200 yards of that at the New Mill, St. Peter's Quay, but the sections of the two differ very much.

Mr. T. Miller wrote (in 1899) that he "failed to shut out salt water at over 300 feet deep"; so that the boring must have been deepened.

13. Stoke Foundry Waterside Works. Messrs. Ransome & Rapier. About 300 yards from the river. 1892.

Made and communicated by Mr. F. Bennett.

Shaft 26 feet, with iron cylinder inside; the rest bored (14½ inches diameter internal ?), with tubes driven to 59 feet from the surface, their top being 14 feet from the surface.

Water stands from 5 to 6 feet down; this differs according to the tide. The water in the well has no connection with the water in the tube, as, after pumping a short time, all the water comes from the tube, the surface-supply not being enough for the required purpose.

		Thickness.	Depth.
		Ft.	Ft.
Mixed gravel and sand - - - - - -		20	20
[Upper Chalk 223½ feet.]	Chalk and flints - - -	6	26
	Chalk, with flints at 155, 201, 202, 224, 225, 236½, 237½, and 238 feet - - - - -	212½	238½
	Rather soft chalk - - -	5	243½

Second Well.

Made and communicated by Mr. F. Bennett.

Cast iron cylinders, of 6½ feet diameter, to the depth of 27 feet. Cast iron pipes, of 15 inches internal diameter, driven 13 feet into the Chalk, Water brackish. Stands at from 4 to 8 feet down, according to the tide. Yield 25,000 gallons an hour, constant supply. Wanted for condensing purposes.

	Thickness.	Depth.
	Ft.	Ft.
Made soil	5	5
? Drift — Sand	½	5½
? Drift — White or light-coloured ooze	1½	7
? Drift — Gravel; red sand and stones mixed	18½	25½
Chalk, with flints at 224, 237, 245, 256 and 259 feet	233½	259

14. Stoke. The Union.

Sunk and communicated by Messrs. Bennett.

Water salt.

To Chalk about 60
In ,, ,, 300 } 360 feet.

15. Messrs. Tollemache and Cullingham's Brewery. In the central part of the town. 1889.

Made and communicated by Mr. F. Bennett.

Shaft 7 feet; the rest bored. Tube driven to the depth of 86 feet. A plentiful supply of good water; rises to within 21 feet of the surface.

	Thickness.	Depth.
	Ft.	Ft.
Black soil	8	8
Red gravel	14½	22½
[Reading Beds] — Red clay	1½	24
[Reading Beds] — Blue clay	11	35
Chalk	186	221

16. Unicorn Brewery. Communicated by the Admiralty.

Bore of 6½ inches diameter. Lined for 76 feet.

Water-level 11½ feet down. After pumping, 15.

Yield 1,200 gallons an hour, of good quality.

To Chalk - 32
Chalk - - 156 } 188 feet.

17. Waterworks, St. Clement's.

From Mr. T. Miller.

About 20 feet above mean tide level, as also is the newer well. Shaft and cylinders about 28 feet, then a bore of 12-inches diameter. Supply abundant.

	Thickness.	Depth.
	Ft.	Ft.
To Chalk	—	27
Chalk, soft and comminuted, with flints at 34 and 40 feet	30	57
Compact chalk, with a few small flints (marked at 58, 64, 70, 76 and 82 feet)	27 ?	84
Pure chalk	111	195

Newer Well. 1888, 1889. About 32 feet from the older well.
From a drawing, communicated by Mr. T. MILLER (and letter).
Shaft and cylinders about 46 feet; the rest bored, 15 inches diameter.
Tubed to the depth of 95 feet.
Yield 54,000 gallons an hour, when pumped down 10 to 11 feet.

		Thickness.	Depth.
		Ft.	Ft.
Made ground		3 or 4	3½
[River Drift]	Loamy gravel	15 to 16	19
	Mottled clay less than	½	20
	Gravel more than	½	
[? Thanet Beds]	Bluish clay, and then green clay, passing down into silt	17½	37½
	Black gravel	1	38½
Chalk	Large flints	½	39
	Soft chalk, with a flint-layer, at a depth of over 31 feet [? 41]. Water in great quantity at 40. Flints at 57 and 58. Very solid chalk marked between 120 and 130 [? extends upward and downward]. Flints at 254, and from 266 to 432, in 68 layers (some very small), continuous from 412 to 420. Soft chalk at 278, 314 to 316½. Hard chalk, between close flints, from 326 to 336, at 352 to 356, at 369. Traces of yellow sand at 304. Metallic ore (pyrites) at various places. Crystalline chalk and crystalline fragments at various places, from 352 to 410.	407	446

The limits within which the supply of the old well are believed to be derived are from 58 to 82 feet, and this part in the new well is excluded by tubing. The water seems to come from between 220 and 320 feet, and boring was left off because there was no perceptible increase in the yield below this depth. The supply is practically independent of the old well, for when the head of water is lowered as much as 10 to 12 feet (starting when both wells are at rest) the water falls only from 6 to 9 inches in the old well. With the 12 feet lowering the yield is 950 gallons a minute.

Mean water-level, in both wells 15 to 16 feet down.

Mr. MILLER says, "The two borings are only about 220 yards from the dock, and it is, I believe, the high level maintained in the dock which heads up the water in the wells to about its level. There is no communication with the tideway nearer than 700 yards up the river, nor than 1,000 yards down the river. When the water in the bore-holes is at rest the surface-level varies only about 6 inches with the tide; but when the head is pumped down there is as much as 2 feet difference between times of high and low water."

Ixworth.

Sunk and Communicated by Mr. WARREN.
(Ordn. Map 189, N.S.; Geol. Map 50 N.W.)

1. In the lower part of the town. Sand, 15 feet.
2. „ „ upper „ „ „ Chalk, 40 „

Kelsale.

(Ordn. Map 191, N.S.; Geol. Map 50 S.E.)

1. Mr. F. W. L. Lane's. 1889.

Bored and communicated by Messrs. Isler.
Water-level 64 feet down. Supply abundant.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift, ? part Crag.]	Blue (Boulder) clay -	15	15
	Sand - - - - -	55	70
	Blowing sand - -	36	106
[Crag, 45 feet.]	Sand and shells -	32½	138½
	Sand and pebbles -	2	140½
	Sand and shells - -	9	149½
	Flints - - -	1½	151
Chalk and flints - - - - - -		70	221

2. Red House Farm [? halfway between Carlton and Rendham.]

Communicated by Mr. F. H. Vertue, of Southwold.

		Thickness.	Depth.
		Ft.	Ft.
Mould and bright clay, with water of fair quality		12	12
[Glacial Drift.]	Gravel - - - - - -	3	15
	Bluish [Boulder] Clay, with chalk-stones - - - - - -	90	105
	Bright sand - - about	10	115
[Crag.] Black muddy sand with a disagreeable smell, and a plentiful supply of clean water		?	?

The classification of the sands is somewhat doubtful. Possibly both may be Drift; but, on the other hand, both may be Crag. Along the neighbouring outcrops the Boulder Clay is next underlain by Glacial sand; but that clay extends to such a depth in the well that it may have cut through to Crag.

Kersey.

(Ordn. Map. 207, N.S.; Geol. Map 48 N.W. and N.E.)

1. Rev. W. B. Clarke, *Trans. Geol. Soc.* ser. 2, vol. v., p. 374. (1840).
Diluvial clay, sandy [? at bottom], 75 feet.

2. Williams Tye or Williams Green, S.W. of the village.
Sunk and communicated (from memory) by Mr. Kingsbury, of Boxford, and from observation F. J. Bennett.

	Thickness.	Depth.
	Ft.	Ft.
Stony yellow clay - - - - - - - - -	15	15
Very dark Boulder Clay, containing a piece of wood very little altered - - - - - -	29	44
Tough, green, sandy clay - - - - - -	2	46
Shingle - - - - - - - - - -	5	51
Boulder Clay - - - - - - - - -	10	61
Brown sand, to water - - - - - - -	2	63

Sunk 3. WILLIAMS TYE GREEN. Marsh Farm, close by the above. and communicated (from memory) by Mr. KINGSBURY, of Boxford.

Stiff yellow stony clay	45	61 feet.
Sand - - - - -	10	
Pebbly sand, to water	6	

Kessingland.

(Ordn. Map 176, N.S.; Geol. Map 49 N.W.)

1. On the northern side of the road leading to the beach, half-a-mile E. by S. of the church. 1879.

Water got at the bottom.

Soil - - - - - - - - - - - - - -	4	12 feet.
[Glacial Drift.] Brown sand - - - - - - - - -	2	
[Chillesford Beds.] Laminated clay and sand (micaceous), the clay stiffer downward - - - - - - - - -	6	

2. Trial-well and boring. For public supply. In field No. 270 of the Ordnance Survey 25-inch Map. 1899.

Communicated by Mr. F. H. ANSON, and from specimens noted by Mr. CLEMENT REID, who has also classified the beds.

About 70 feet above Ordnance Datum. Shaft 60 feet, the rest being a boring 8 inches in diameter.

		Thickness.	Depth.
		Ft.	Ft.
Soil, earthy loam - - - - - -		1½	1½
Boulder-Clay.	Yellow Boulder Clay, with chalk -	13	14½
	Lead-coloured Boulder Clay with chalk - - - - - -	13½	28
Glacial Drift.	Fine-grained laminated sand, with mica; the bottom 6 inches being more ferruginous - -	8½	36½
	Fine chalky sand - - -	3½	40
Probably Glacial.	Subangular gravel (flint, quartz, etc.)	20	60
	Brown gravelly sand - - -	½	60½
	Ferruginous sand and small stones	10	70½
Chillesford Clay, 16½ feet.	Ferruginous micaceous loam -	2	72½
	Grey micaceous loam - - -	7½	80
	Grey, more micaceous loam -	5	85
	Grey micaceous loam, harder and sandy - - - - - -	2	87
Crag.	Grey sand and small stones - -	11	98
	Gravel (flint-pebble & subangular quartz) - - - - - -	1	99
	Grey sand, with fragments of *Mytilus* - - - - - -	31	130
	Grey silty sand, with *Littorina littorea*, *Purpura lapillus*, *Tellina obliqua*, and *Cyprina islandica*	5	135
	Silty micaceous grey sand, with *Tellina* - - - - - -	13	148
	Grey sand, the bottom 7 feet with *Mytilus* and *Tellina prætenuis* (?)	13	161
	Hard, greenish-grey, micaceous loam	1½	162½
	Greenish-grey, micaceous, silty sand	1½	164
	Grey silty sand, somewhat coarser, with a few shell-fragments -	16	180

A letter (of September, 1900) from Messrs. TILLEY, who were called in after the work was finished, gives the following further information :—The water-level was 61 feet down. From the deep boring practically no water was got ; but from a fresh boring, put down by them to the depth of 80 feet (from the surface), about 9 gallons a minute were obtained.

Dr. R. B. Low, in his Report to the Local Government Board in 1896, says that at Kessingland the water supply is from surface-wells, generally near the houses, from 6 to 40 feet deep, the majority (especially at Beech End) being under 15 feet. Excremental pollution of many seemed easy and probable. For analyses see p. .

Kettlebaston (High House Farm).

(Ordn. Map 206, N.S. : Geol. Map 50 S.W.)
Communicated by the Rev. E. HILL.
About 230 feet above Ordnance Datum. 70 feet to water.

Kirton (Rectory, 1876).

(Ordn. Map 208, N.S. ; Geol. Map 48 N.E.)
About 66 feet above Ordnance Datum.
Sunk and communicated by Messrs. BENNETT, of Ipswich.
Good supply of pure water to within 64 feet of the surface.

	Shaft 16 feet, the rest bored.	Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[London Clay, 110½ feet.]	Brown clay - - - - - -	68	0	68	0
	Rock [septaria] - - - -	1	1	69	1
	Clay - - - - - - -	14	11	84	0
	Rock [septaria] - - - -	1	1	85	5
	Clay - - - - nearly	5	11	91	0
	Rock [septaria] - - - -	1	6	92	6
	Clay [a specimen of rock, marked 98 feet] - - - - - -	13	0	105	6
	Dark loam [a specimen of brown clay, marked 110 feet, *i.e.*, just below this]- - - - -	5	0	110	6
	[Basement-bed ?]. Stones and loamy gravel - - - -	1	0	111	6
[Reading Beds, 44½ feet.]	Fine loamy sand - - - -	2	0	113	6
	Mixed clay, light-coloured and dark [a specimen of brown mottled clay, marked 115 feet] - -	5	0	118	6
	Soft rock or marl - - - -	0	6	119	0
	Blue clay, streaked with red [specimens of brown mottled clay, grey and red mottled sandy clay, grey mottled sandy clay, and red and grey mottled clay, marked 120, 133, 135, and 137 feet] - -	20	6	139	6
	Red loam [specimens of red and grey mottled clay, and brown clay, marked 139 and 147 feet] -	12	6	152	0
	Green clay streaked with grey [specimens of green sandy clay and green sandy clay mottled brown (2), marked 151, 153, and 155 feet.] - - - - - -	4	0	156	0
Chalk - -	- - - - - - - - - -	48	0	204	0

Lackford.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)
From Mr. W. Warren.

1. Bridge Farm. Black Sand, 15 feet.

	2. The Green.	3. Parsonage.
[Boulder] Clay -	5	8
Chalk - -	70	70

Langham. (The Hall.)

(Ordn. Map 189, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Warren.

Brickearth	10	25 feet.
Chalk - -	15	

Lavenham.

(Ordn. Map 206, N.S.; Geol. Map 50 S.W.)

1. Bolton and Partners, Limited.

(Between the Railway Station and the Town). 1884.
Communicated by Col. Sir F. Bolton, R.E.

Level of the ground 40 feet below that of the rails at the Station.

Shaft about 7 feet, the rest bored (with 18-inch cylinders 7 feet into the Chalk).

Water-level in the Gravel 16 feet down, and at the same level in the tube [from Chalk].

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift].	Sand and gravel - - - -	60	60
	Flint drift - - - - - -	17	77
Chalk, 211 feet	Soft chalk (water-bearing fissure at a depth of 174 feet) - - Hard chalk - - - - -	159	236
	Very hard chalk, with water at the depth of 258 feet, and with a flint bed just below - - -	52	288

2. Greyhound Inn, 1827.

Rev. W. B. Clarke, *Trans. Geol. Soc.* ser., 2, vol. v., p. 375 (1840).

[? Boulder Clay]	Light-yellow clay - - - -	14	76 feet.
	Stiff blue clay, with many chalk-stones	14	
	Dirty clay and black mould - -	12	
	Clay, with chalk-stones and coal -	30	
White and yellow sand and gravel, with water -		6	

"At 50 feet mephitic air, which put out candles and killed chickens."

Three other wells. Same authority.

3. The Parsonage. Blue clay with a layer of chalk-stones 45 feet.
4. The Cock Inn. Clay 45 feet.
5. The Mill. Soil and clay 56 feet.

6. Hall Farm, 1¼ miles N. of the town. 7. A little N. of the former.

From information on the spot. F. J. Bennett.

	6.		7.
Brickearth - -	10	- - -	16 feet.
Gravel and stones -	10	- - -	14 ,,
Blue loam - -	10	- - -	— ,,
Boulder Clay- -	100	- - -	10 ,,
To sand and water	130	To strong spring	40 ,,

8. House by the Railway Station.

Communicated by Mr. PORTER, formerly of Lavenham.
Boulder Clay, to sand and water, 70 feet.

9. SUGAR FACTORY, at stream-level, close by the Railway Station.

Communicated by Mr. PORTER.

Boulder Clay -	10	30 feet.
Gravel - -	20	

10, 11. WINDMILLS, northward of the Railway Station.

Information from F. J. BENNETT.

Easterly Mill.

Gravel and sand - - - -	25	65 feet.
Boulder Clay, to sand and water -	40	

Westerly Mill.

Boulder Clay -	40	60 feet.
Loam - -	20	

Lawshall. RECTORY.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)
Sunk and communicated by Mr. FROST.
Through Boulder Clay to sand and water, 225 feet. [!].

Laxfield.

(Ordn. Map 191, N.S.; Geol. Map 50 N.E.)

"The *Water Supply* of outlying houses is chiefly derived from private wells, of no great depth; but for the village itself surface water from adjoining fields is collected in a deep pond . . at the higher end of the village, whence it is conveyed by a pipe to a filter bed." Dr. R. B. Low's Report to the Local Government Board, 1894, p. 1.

Leavenheath. Called Leadenheath on the old map. The Hare and Hounds.

(Ordn. Map 223, N.S.; Geol. Map 48 N.W.)
Sunk and communicated (from memory) by Mr. KINGSBURY, of Boxford.

Loam - -	6	46 feet.
Sand and gravel	40	

Leiston. IRONWORKS.

(Ordn. Map 191, N.S.; Geol. Map 50 S.E.)
Information from Mr. GARRETT (from memory).
About 60 feet above the sea.
Water-level, 34 feet down.

	Thickness.	Depth.
	Ft.	Ft.
Brickearth, clay, and sand - - -	45	45
Blowing sand (yields 8–10 gallons a minute)	5	50
Brickearth, clay, and moulding sand -	80	130
Blue shelly Crag (yields 80 gallons a minute)	60	190

Borehole since filled with shelly sand, but it must have very nearly reached the Tertiary clay, as the estimated position of the Chalk surface is only 229 feet down. W. H. DALTON.

Another boring. 1893.

Communicated by Messrs. GARRETT [with additional remarks from notes on samples by Mr. C. REID, in these brackets].
A boring in the old shaft. 58 feet above Ordnance Datum. No adequate supply (January, 1893).

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Shaft [Drift and Red Crag ?		—		35	10
[Red Crag.]	Red shelly Crag [*Purpura lapillus*]	30	0	65	10
	Pan of loam [hard loamy Crag]	0	6	66	4
	Red shelly Crag	14	0	80	4
	Red sand [Coarser shelly Crag]	3	6	83	10
	Blue loam [bluish, sandy]	0	6	84	4
	Blue sand [bluish-brown]	1	6	85	10
	Blue loam [bluish, sandy]	2	0	87	10
	Crag [blue, shelly. *Pectunculus glycimeris, Mactra, Cardium, Pecten, Nucula*]	8	0	95	10
	Stiff loam [blue, with broken shells]	2	6	98	4
	Crag [blue, with broken shells]	4	0	102	4
	Stiff clay, with boulders [bluish, with ironstone-nodule]	0	6	102	10
	Blowing Crag [grey, with perfeet shells. *Cyprina islandica, Tellina obliqua, Pecten opercularis, P. maximus, Trophon antiquus, Cardium grœnlandicum, Natica, Buccinum, Purpura, Mactra*]	6	6	109	4
	Stiff loam	2	0	111	4
	Crag [grey, with broken shells]	3	0	114	4
	Blue loam [micaceous]	6	6	120	10
	Crag [coarse, grey, with broken *Turritella* and *Cyprina*] 3 inches of rock [shelly ironstone] at the base	3	9	124	7
	Blowing Crag [grey, with broken shells]	6	9	131	4
	Blowing sand [fine]	10	6	141	10
	Blowing Crag [grey, with broken shells. *Mya*]	26	9	168	7
	Rock [two pitted polished phosphatic nodules, and a small septarian nodule ?]	1	1	169	8
[London Clay, 48⅓ feet.]	Clay [brown], with rock [septaria] at 183 ft. 4 in. to 184 ft. 6 in. and 7 in. at the base	22	3	191	11
	Clay (? brown, sandy, micaceous) [greenish-brown, mottled], with rock at 197 ft. 4 in. to 198 ft.	26	1	218	0
[?Oldhaven Beds, over 26 feet.]	Loamy sand (? fine, grey, with flint pebbles)	15	6	233	6
	Rock, (sandstone)	2	8	236	2
	Sand	8	0	244	2
[Reading Beds, over 53½ feet.]	Stiff Clay	4	8	248	10
	Sand	2	4	251	2
	Clay	1	6	252	8
	Green loam	3	6	256	2
	Mottled loam	8	0	264	2
	Blue clay	4	6	268	8
	Dark green clay	20	4	289	0
	Red clay	6	0	295	0
	Green clay	1	9	296	9
	Flints	1	0	297	9
Chalk, hard, with flints at 319½, 332½, 352½, 380, 413 f. 10 in., 436, 438, and 441		189	3	487	0

Little Blakenham.

(Ordn. Map, 207 N.S.; Geol. Map 50 S.W.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 379 (1840).

Water rose to within 62 feet of the surface.

Clay,	157	159 feet.
Chalk,	2	

Little Saxham.

(Ordn. Map, 189 N.S.; Geol. Map 51 S.E.)

1 and 2 from Mr. Prewer, 3 and 4 from Mr. Warren.

1. Near the Church. Chalk, 140 feet.
2. Potash Cottage. Boulder Clay, to land-spring, 25 feet.
3. Railway Station. Boulder Clay, 15 feet: Chalk, 160 feet.
4. South of the Church. Boulder Clay, 40 feet: Chalk, 120 feet.

Livermere (At the Park).

From Mr. Warren.

(Ordn. Map, 189 N.S.; Geol. Map 50 N.W.)

[Glacial Drift]	[Boulder] Clay,	15	20 feet.
	Sand - -	5	

Long Melford (Railway Station).

(Ordn. Map, 206 N.S.; Geol. Map 47.)

From information on the spot.

Supply about 6,000 gallons a day.

[Glacial Drift]	Gravel and sand,	about 19	47 feet.
	Blue [Boulder] clay	,, 28	

Lound (Lound Farm).

Now disused.

(Ordn. Map, 162 N.S.; Geol. Map 67 S.W.)

[Glacial Drift.] Sand and gravel, to water, about 50 to 60 feet.

Lowestoft.

(Ordn. Map, N.S. 176; six-inch Map, 10; Geol. Map 67 S.W.)

This town is supplied chiefly by a Water Company and, to a less extent, from surface-wells, which are most numerous in the older parts.

The Company's supply comes from the Mill-water, an extension of Fritton Broad, about seven miles from the town.

From the lake the water is pumped up to filter-beds, from which it passes into a catchment-chamber, whence it is pumped to covered reservoirs at Lowestoft.

Mr. Sutton has reported on the water as excellent; but less favourable opinions have also been expressed.

Many of the surface-wells have become contaminated.

Condensed from Dr. S. Monckton's Report to the Local Government Board, 1896, pp. 2, 3.

1. Brickyard, ⅝ mile W.S.W. of St. Margaret's Church.

[Glacial Drift]	Boulder Clay,	2	33 feet.
	Buff Sand,	30	
[Pebbly Series]	Shingle, with water,	1	

2. East Anglian Ice Company's Works, near Lake Lothing. 1902.

Made and communicated by Messrs. Tilley. (Remarks in brackets made from specimens.)

A good supply of water was got between 480 and 550 feet down, but unfortunately it contained much magnesia. A fresh set of tubes (of 10 inches diameter) was driven down to 490 feet, to shut off this water. At that depth the Chalk is practically waterless. Later tubes (of 8 inches diameter) were put down to the depth of 558 feet.

According to information from the Company, at the depth of 680 feet about 3,000 gallons an hour were pumped, for four days, when the water turned salt.

		Thickness.	Depth.
		Ft.	Ft.
[Drift]	Red loamy gravel	12	12
	Fine light-coloured sand (specimen rather coarse)	13	25
	Grey sand (light-coloured), with stones	10	35
	Light-coloured sand (fine), with stones	7	42
	Coarse grit with stones (flint-shingle)	2	44
	Light-brown sand (with some small bits of flint)	12	56
	Sandy blue clay (brownish-grey, micaceous)	2	58
	Sandy loam (fine, grey, compacted loamy sand)	4	62
	Dark-grey sand	1½	63½
	Grey sand (browner than the above)	1½	65
	Red sand (pale brown, with some more or less rolled flints)	4½	69½
Blue [? Chillesford] clay (grey and brownish-grey, rather sandy, micaceous clay)		4½	74
[Crag, 166 feet]	Sandy loam (grey, compacted loamy sand)	2	76
	Dark-grey sand (light-grey)	10	86
	Dark loamy sand (light-grey, compacted loamy sand)	14	100
	Sharp sand (light-brownish-grey)	38	138
	Sharp sand (grey), with shells	43	181
	Fine silty sand (grey, compacted)	5	186
	Sharp sand, with shells	42	228
	Mild clay, with shells (greenish-grey clayey sand)	12	240
[London Clay, 160 feet]	Strong, light-coloured clay (greyish sandy clay)	2	242
	Sandy clay (greenish-grey and brownish-grey clayey sand, bits of shells at 243 feet: ? carried down)	8	250
	Strong dark clay (brown, bits of shells: ? carried down)	2	252
	Sandy clay with bastard flints (brown, bits of shells at 253 feet: ? carried down)	5	257

	Thickness	Depth.
	Ft.	Ft.
[London Clay 160 feet.] London Clay, with yellowish rock at 310 feet 6 inches to 311 feet 4 inches, and grey rock, very hard (septarian), at 327 to 328½ feet and 340 to 340¾ feet (specimen of brown clay from top part, of septarian stone at 303 feet, of brownish flint at 310 feet) - - - - -	143	400
[Reading Beds.] Mottled clay (at 400 feet, curious dark bluish and greenish-grey; at 435 feet, grey with greenish specks; at 438 and 446 feet, reddish mottled; at 447 feet, buff earth, ? very finely divided sand, with some brownish clay; at 447½ feet, brown clay; at 455 feet, very dark grey with some red bits; at the bottom very dark-grey clay, with some green sand and green-coated flints) - - - - - - - -	75	475
Chalk - - - - - - - - - - -	205	680

From a specimen of the shelly sand, between 138 and 181 feet deep, Mr. E. T. Newton determined the following fossils, a result which, as he says, "is better than could be expected from such ground-up material." He adds that "the bed must be very rich, and looks like being Red Crag."

Trophon antiquus.
Trochus (?).
Turritella (?).
Cardium.
Mytilus edulis.
Pecten opercularis.
Tellina obliqua.
T. prœtenuis.
Venus ovata.
Fragments of other lamellibranchs.
Cupularia sp.
Cellepora sp.
Salicornaria (?).
Echinocyamus pusillus.
Spatangus sp. (fragment).
Balanus sp.

3 Youngman & Preston's Brewery, 69 High Street, at the foot of the old cliff. 1897.

About 20 feet above high-water level.

Made and communicated by Messrs. Isler & Co. (Remarks in brackets from notes on specimens, by Mr. Clement Reid.)

Water-level 15 feet down. Unsuccessful.

	Thickness.	Depth.
	Ft.	Ft.
Made ground - - -	5	5
Sand (clean, gravelly; dune ?)	8	13
Pebbles (recent beach) - -	4	17
Sand (clean buff) - - -	20	37
Blue clay [? Chillesford] -	24	61
Sand - - - - - -	9	70
Clay - - - - - -	8	78
Sand - - - - - -	127	205

Below 17 feet Mr. REID's account differs, being more detailed and as follows :—

	Thickness.	Depth.
	Ft.	Ft.
Clean buff sand - - - - - - - -	28	45
Blue silt - - - - - - - - -	19	64
Coarse gravelly sand - - - - - - -	1½	65½
Brown silt - - - - - - - - -	14	79½
Bluish sand - - - - - - - - -	13	92½
Shingle - - - - - - - - - -	½	93
Gravelly sand (*Mytilus, Mya, Cyprina,* at 120 feet; *Trophon* at 137; *Littorina littorea, Purpura lapillus, Anomia, Astarte sulcata?, Cardita, Cardium edule, Corbula gibba, Cyprina, Leda oblongoides, Mya arenaria, Mytilus edulis, Pecten opercularis, Pectunculus, Pholas crispata, Tellina, Balanus crenatus,* from 146 feet (in greenish-grey gravelly sand, with some green-coated flints); *Mya* at 150; *Cyprina* at 153) - - - - - - - -	73½	166½
Gravelly sand, full of fossils:—*Aporrhais pes-pelecani, Littorina littorea, Trophon antiquus* (dextral), *Astarte compressa, A. sulcata, Cardium, Cyprina islandica, Mactra ovalis, Mya arenaria, Mytilus, Pecten opercularis, Pectunculus glycimeris, Tellina obliqua,* fish-bones - - - - - - - -	33½	200

From this it is clear that the Crag reaches to a depth of over 200 feet. The preceding section shows that it goes down to about 240 feet.

Market Weston.

(Ord. Map 175, N.S.; Geol. Map 50 N.W.)

1. No precise locality.

[Boulder] Clay - - - - -	20	feet.
Sand - - - - - - 20	50	
Gravel, in which a bone was found -	10	

2. SMALL FARMHOUSE ON THE BURY ROAD, NEAR HOPTON GREYHOUND. 1889.

Made and communicated by Messrs. GEDNEY (of Norwich).

Shaft, 35 feet, the rest driven tube.

		Thickness.	Depth.
		Ft.	Ft.
Made Soil - - -		1	1
[Drift]	Red sand -	15	16
	Grey sand -	14	30
	Quick sand -	5	35
	Gravel - -	12	47
	Sharp red sand	16	63
	Grey sand -	38	101

Melford, *see* Long Melford.

Mellis.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

1. ON THE GREEN.

Water rose 8 feet. [Boulder] Clay 60 feet.

2. THE RECTORY.

[Boulder] Clay, to sand and water, 61 feet.

3. ON THE COMMON. Sunk and communicated by MR. DAY.

[Boulder] Clay -	54	57 feet.
Sand - - -	3	

Melton.

(Ordn. Map 208, N.S.; 6 in. Map 67, 68; Geol. Map 50 S.E.)

1. BREWERY (Mallet's). 1874.

Sunk and communicated by Messrs. BENNETT, of Ipswich, and information got by W. H. DALTON.

About 28 feet above the level of the sea.

Good supply of water to 21 feet from the surface.

Depth of old well (the rest bored) - - -	25	211 feet
Sand, greenish and clayey towards the bottom	35	
Chalk - - - - - - - - - -	151	

2. SUFFOLK COUNTY ASYLUM, on the high ground, 1882.

2. Made and communicated by Messrs. LE GRAND and SUTCLIFF. Water-level 97 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Dug well (the rest bored) - - - - - - -		—	63
[Crag] Sand and shells - - - - - - -		11	74
[London Clay, 17 feet.]	Blue clay - - - - - -	14	88
	Dark green sand [Basement-bed] -	3	91
[Reading Beds, 35 feet.]	Mottled clay - - - - -	13	104
	Grey running sand - - - -	16½	120½
	Dark sandy clay - - - - -	3	123½
	Chocolate-coloured clay - -	2½	126
Chalk and flints - - - - - - - - -		244	370

According to a Report by Mr. G. HODSON (1894) the upper part of the Chalk was found to yield bad water, and, after this had been excluded, the deeper part of the Chalk was found to be practically dry.

LATER BORINGS between the Church and the Railway Station.

From a Report by Mr. G. HODSON, 1894.

Precautions were taken "to prevent the upper water gaining access to the Chalk water" by driving steel tubes as far down into the Chalk as possible, etc. Nevertheless analysis proved "that water from the upper strata obtains access to the bore-hole," and further protective works were proposed, including filtration and softening.

Test-boring, No. 1, 1891.

Yield proved to be 348,000 gallons a day. Water very hard.

		Thickness.	Depth.
		Ft.	Ft.
Soil		3	3
[Drift and Crag ?]	Sand and gravel	$4\frac{2}{3}$	$7\frac{2}{3}$
	Sand	$10\frac{1}{2}$	18
[Reading Beds, 34 feet.]	Coloured [mottled] clay and drift-flints	2	20
	Mottled clay: Red	2	22
	Mottled clay: Light blue	$\frac{1}{2}$	$22\frac{1}{2}$
	Brown sandy clay	$8\frac{1}{2}$	31
	Green sandy clay	1	32
	Brown running sand	12	44
	Blue clay	6	50
	Green sand and flints	2	52
[Upper Chalk]	Flints and chalk	248	300

Test-boring, No. 2, 1891 (?).

Yield insufficient at the depth of 300 feet. Continued for another 50, in which a further supply was found. Yield proved to be 240,000 gallons in 24 hours, the water being lowered 14 feet.

		Thickness.	Depth.
		Ft.	Ft.
Soil		3	3
[Drift ?]	Sand and Gravel	14	17
[Reading Beds, 35 feet.]	Coloured [mottled] clay	5	22
	Sand and clay	2	24
	Brown clay	8	32
	Running sand	12	44
	Sand and clay	3	47
	Dark clay	4	51
	Green sand	1	52
[Upper Chalk]	Flints and chalk	298	350

Mendlesham.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

1. Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).

Diluvial [Boulder] clay 40 } 42 feet.
Chalk - - - 2 }

Information got by J. H. Blake. (3 wells.)

		Ft.
2. A little N. of the church.	Boulder Clay	80
3. Mendlesham Lodge, nearly a mile W.N.W. of the church		90
4. Mendlesham Green, $1\frac{3}{4}$ miles southward of the town (2 wells)		91

Milden (W. of the Church).

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)

Sunk and communicated (from memory) by Mr. Kingsbury.

Boulder Clay - 12 }
Sand - - 12 } 104 feet.
Chalk - - 80 }

Mildenhall (Silk Manufactory).

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)
Sir H. Bunbury. *Trans. Geol. Soc.*, ser. 2, vol. i., p. 379 (1824).
? Bored throughout.
Water (found at the bottom) rose, but not to the surface.

		Thickness.	Depth.
		Ft.	Ft.
Sandy loam		1	1
[Middle and Lower Chalk.]	White chalk without flints	35	36
	Yellowish gritty chalk	5	41
	Grey hard chalk	136	177
[? Chalk Marl]	Blue clay	54	231
	Darker, heavier, and harder clay, passing into the next bed - about	10	241
[? Chalk Marl and Upper Greensand.] Blue clay with green sand - nearly		10	251
[? Upper Greensand.] Greensand with fragments of fossils (particularly *Belemnites* and *Pentacrinites*)		10 or 11	261½
[Gault] Blue clay with fragments of large shells		9 or 10	271

The classification attempted is doubtful. Can the boring have reached through Gault and Lower Greensand to Kimeridge Clay?

Monewden. Mr. Haggars (Plumber). 1876.

(Ordn. Map 190, N.S.; Geol. Map 50 S.E.)
Sunk and communicated by Messrs. Bennett, of Ipswich.
Shaft throughout.
Good supply, 5½ feet from the bottom.

			Thickness.	Depth.
			Ft.	Ft.
[Glacial Drift.]	[Boulder Clay.]	Light-coloured clay and stones	10	10
		Large stones	1	11
		Blue clay and chalk stones	19	30
	[Glacial Gravel, &c.]	Blue loam	3	33
		Coarse gravel and stones	12	45
		Clay and marl	5	50
		Sand	¼	50¼
[Chalk.]	Chalk		1	51¼
	Hard craig mixture [? hardened brecciated chalk]		2	53¼
	Chalk		7¾	61

Monks Eleigh (probably on the higher ground).

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 374. (1840).
Diluvial [Boulder] clay to chalk, 62 feet.

Moulton (From Mr. Warren).

(Ordn. Maps 188, 189, N.S.; Geol. Map 51 S.E.)

Loam	10	25 feet.
Chalk	15	

Naughton (Rectory).

Ordn. Map, new series, 207; 6 in. Map 65; Geol. Map 50 S.W.
Communicated by the Rev. E. Hill, from information from Mr. E. S. Cobbold.

Blue [Boulder] Clay, to the depth of 130 or 140 feet.

Needham Market. 1807.

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)

1. Made in 1807.

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 379 (1840).

Gravel - - - - - - -	10	To Chalk 18 feet.
Dark blue [Boulder] clay, with chalk stones -	8	

2. Another well. Same authority.

Stiff loam	10	40 feet.
Gravel -	6	
Chalk -	24	

Newton (Rogers' Farm, a mile N.E. of the Village).

(Ordn. Map 206, N.S.; Geol. Map 48 N.W.)
Sunk and communicated by Mr. Kingsbury.

Chalky clay -	40	55 feet.
Sand and gravel	15	

See also **Old Newton.**

Norton Hall.

(Ordn. Map 189, N.S.; Geol. Map 50 S.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).
Blue [Boulder] clay and sand, 75 feet.

Occold.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)

1. Dr. Miller's.

Sunk and communicated by Mr. Limmer.

[Boulder] Clay	20	98 feet.
Gravel and sand	78	

2. The Hall.

Sunk and communicated by Mr. Day.

[Boulder] Clay	50	80 feet.
Sand -	30	

Old Newton.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

1. Rev. W. B. Clarke, *Trans. Geol Soc.*, ser. 2, vol. v., p. 378 (1840).
Diluvial [Boulder] clay, 50 feet.

2. Another section, communicated by Col. J. Hasted.

Soil - - - -		$1\frac{1}{2}$	118 feet.
[Glacial Drift]	[Boulder] Clay	$53\frac{1}{2}$	
	Fine sand -	64	

3. Near the Shoulder of Mutton Inn (For public supply 1898).

Communicated by Dr. F. Parsons.

Water-level 80 feet down. Yield 300 gallons an hour, from a tube of 4 inches diameter.

	Thickness.	Depth.
	Ft.	Ft.
[Boulder] Clay	40	40
Dark loam -	13	53
Sand - -	75	128
Chalk - -	144	272

4. Rookery Farm, a mile N.E. of Haughley Station.

Communicated by Mr. W. Biddell, of Lavenham.

		Thickness.	Depth.
		Ft.	Ft.
[Boulder Clay.]	Blue Clay - - - - - - -	40	40
	Grey sand - - - - - - -	1	41
	Dark loam, with fossils, chiefly vertebræ and coprolites (?) - - - -	20	61
[Glacial Sand.]	Red sand - - - - - - -	24	85
	White sand, with sea-weed [? dendrite]. With water, good but hard - -	3	88

Orford Marshes.

(Ordn. Map 208, N.S.; Geol. Maps 48, N.E. and 50, S.E.)

Lantern Marshes (No. 1, E. of Sudbourn. 1875).

About 6 feet above Ordnance Datum.

Sunk and communicated by Messrs. Bennett, of Ipswich. Water overflows.

		Thickness.	Depth.
		Ft.	Ft.
Depth of old bore - - - -		—	100
[London Clay.]	Blue Clay - -	65	165
	Dark sand - -	2	167
	Brownish clay - -	10	177
	Hard rock - -	1	178
[Reading Beds.]	Dark loam - -	3	181
	Brownish clay -	20	201
	White and red sand	4	205
	Clay - - -	18	223
	Flints - - -	1	224
Chalk - - - - - - -		96	320

Lantern Marshes (No. 2. 1876. Half a mile S.S.E. of No. 1 and E.N.E. of Orford).

Sunk and communicated by Messrs. Bennett, of Ipswich.

Supply ample but very brackish, rose 2 feet above the surface; in August, 1878, as copious, less brackish; in June 1879, still better, but had to be shut off during the wet season.

		Thickness.	Depth.
		Ft.	Ft.
[Alluvium.]	Ooze	24	24
[? Red Crag.]	White sand and shell	7	31
[London Clay, about 129 feet.]	Blue clay	97	128
	Rock [Septaria]	1	129
	Dark brown clay	30	159
	Rock [Septaria]	1¼	160¼
[Reading Beds, about 50 feet.]	White sand	6	166¼
	Clay	14	180¼
	White sand	5¼	185½
	Red and green running sand [Specimen of red and grey mottled sand, from 186 feet]	8½	194
	Blue clay	16	210
Chalk		70	280

(No. 3. About 250 yards N.W. of High Light Bridge, more than a mile south-westward of No. 2.)

For Lord Rendlesham, 1879.

About 6 feeet above Ordnance Datum.

Sunk and communicated by Messrs. Bennett, of Ipswich.

A good supply of water (brackish) rises 14 inches above the surface.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[Alluvium, 20 feet]	Light-coloured Ooze	19	0	19	0
	Brown Ooze	1	0	20	0
White [bluish shelly deoxidised Red] Crag		10	0	30	0
[London Clay, 106¾ feet.]	Clay	67	9	97	9
	Septaria	1	0	98	9
	Clay	25	0	123	9
	Brown clay	10	0	133	9
	Loamy sand [? Basement-bed]	3	0	136	9
[Reading Beds, 42½ feet.]	Mottled sand	14	0	150	9
	Green sand and loam	12	0	162	9
	Dark clay, hard and dry	12	0	174	9
	Mottled red and green clay	3	2	177	11
	Green clay and brown flints	1	3	179	2
Chalk		55	10	235	0

4. Lantern Marshes.

(Lord Rendlesham's), 1878. A little northward of No. 1.
About 6 feet above Ordnance Datum.
Sunk and communicated by Messrs. Bennett.

—		Thickness.	Depth.
		Ft.	Ft.
[Alluvium.]	Soft Clay - - - -	30	30
[Red Crag.]	White crag - - - -	2	32
[London Clay, 108 feet.]	Brown clay - - - -	4	36
	London Clay - - -	23	59
	Rock [septaria] - - -	1	60
	London Clay- - - -	25¼	85¼
	Rock [septaria] - - -	¾	86
	London Clay - - -	12	98
	Rock, very hard [septaria]	1	99
	Brown clay - - - -	37	136
	Soft loam (light colour) - -	4	140
[Reading Beds.]	Very fine sand (nearly white)	12	152

After getting down some 160 feet this well was abandoned owing to failure in one of the tubes.

The Nos. 1, 2, 3 are those marked on the Geological Survey Map, 50 S.E. These three borings show a fall in the top of the Chalk from 173 feet below Ordnance Datum in No. 3 to about 204 in No 2, and 218 in No. 1. But the fourth boring, still further north, seems not to agree, getting through the London Clay a little sooner.

Otley (Otley Bottom, 1904).

(Ordn. Map 207, N.S.; Geol. Map 50 S.E.)
Communicated by the Rev. R. A. Bullen. Made by G. R. H. Allen, of Wickham Market.

[Drift]	Boulder Clay. Blue clay and chalk - -	25	40 feet.
	Coarse red sand, to running sand and water	15	

Ouseden.

(Ordn. Map 189, N.S.; Geol. Map 51 S.E.)

1. Hall Farm. Boulder Clay 30 feet. Chalk (no water), 140 feet.
2. ,, ,, ,, ,, 30 ,, Good supply of water.
3. Lady's Green. A quarter of a mile E. of the church. Boulder Clay 30 feet. Water rose to surface. (From Mr. Warren).

Oulton Broad (Near the Railway Station).

(Ordn. Map, new series, 176; 6 in. Map 10; Geol. Map 67 S.W.)
Communicated by Mr. C. E. Hawkins, from a rough note taken by him; but he has forgotten the source of his information.

		Thickness.	Depth.
		Ft.	Ft.
[Drift]	Sand and gravel - - - -	18	18
	Running sand and water - - -	30	48
Blue [? Chillesford] clay - - - - -		14	62
[Crag]	Grey blowing sand - - - -	117	179
	Yellow clay - - - - -	20	199
	Blowing sand - - - - -	43	242
London Clay. Iron-pan, 4½ inches thick, 278 feet down; and another, 14 inches thick, 16 feet lower [? septaria] - - - - -		73	345

Pakenham.

(Ordn. Map 189, N.S.; Geol. Map 50 N.W.)

At Nether Hall.

Sunk and communicated by Mr. WARREN

Chalk, 25 feet.

Palgrave.

(Ordn. Map 175, N.S.; Geol. Map 50 N.W.)

Near the Lion Inn.

Sunk and communicated by Mr. DAY.

[Boulder] Clay - - -	35	41 feet.
Marl. To Chalk, no water -	6	

Parham. (No precise locality.)

(Ordn. Map 191, N.S.; Geol. Map 50 S.E.)

Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377 (1840).

Diluvial [Boulder] Clay -	25	55 feet
Sand [? partly Crag] -	30	

Polstead.

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

Burnt House Farm, 1½ miles E. of the village.

Sunk and communicated (from memory) by Mr. KINGSBURY, as was also the following section.

Chalky clay -	10	55 feet.
Sand and gravel-	45	

Polstead Heath (THE SHOULDER OF MUTTON).

(Ordn. Map 207, N.S.; Geol. Map 48 N.W.)

Stony loam - - -	15	70 feet.
Chalky clay - - -	25	
Fine buff sand, to water	30	

Poslingford.

Ordn. Map, new series, 206; ? 6 in. Map, 62; Geol. Map 47.)

1. CHIPLEY ABBEY (N.N.W. of village).

Communicated by Mr. J. WEALL (1885).

Yield (from the bore) 2½ gallons a minute.

Shaft (made 40 or 50 years ago), presumably in Boulder Clay	145	387 feet.
Bored (1882, 3). To the Chalk - - - - - - -	5	
Chalk - - - - - - - -	237	

2. Poslingford House. About three quarters of a mile north of the village. 1902.

Communicated by Major G. R. Darley.

		Thickness.	Depth.
		Ft.	Ft.
[Boulder Clay]	Brick clay	1	1
	Brown clay with chalk	13	14
	Blue clay (5 and 10 ft.), 8 ins. of solid chalk [boulder] at the bottom	15	29
	Grey sand, with a little water	6	35
	Blue clay and chalk	5	40
	Blue clay with layers of chalk	50	90
	Grey sand and clay	1	91
	Blue clay with boulder-chalk	19	110
[Drift]	Flint sand and small drift. With a good supply of water	80	190
	Brown loam (described as 1 foot thick)	14	204
? Eocene]	Green sand and flints	4	208

Raydon Woodhouse.

(Ordn. Map ? 207 or 208 N.S.; Geol. Map. 48 N.)

Sunk and communicated (from memory) by Mr. Wellum, of Raydon.

Chalky clay - - - 30
Red Sand (? Crag) to water 12 } 42 feet

Redgrave.

(Ordn. Map 175, N.S.; Geol. Map 50 N.W.).

At the four cross-roads, near the Greyhound Inn.

Water rose 3 feet.

[Drift]
Sand - - 1
Brickearth - 7
[Boulder] Clay - 7
Brickearth - 15
Sand - - 5
} 35 feet.

Redisham, *see* Great Redisham.

Reed or Rede. From Mr. Prewer.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.).

1. Reed Green. Boulder Clay, to gravel, from which water rose to the surface, 10 feet.

2. Reed Hole. Boulder Clay, to land-spring, 20 feet.

Reydon.

(Ordn. Map 176, N.S.; Geol. Map 49 N.W.)

1. The Hall, 1905.

Information from Mr. Wilmer.

Soil and sand about 7
Clay - - ,, 3
Crag, very shelly ,, 35
} 45 feet.

The height to which this brings the Crag is more than one would expect: perhaps some part of what is here called Crag may rather belong to the overlying sand or gravel. Mr. W. M. Crowfoot, of Beccles, has a collection of the shells found, of which a list is given in the Southwold Memoir.

2. For the Southwold Water Works Company. In field 294 of the Ordnance Map, on the eastern side of Quay Lane at the junction with the Halesworth Road.

Information from Mr. J. M. WOOD, 1905.

Varying from 18 to 20 feet above Ordnance Datum.

Level of the water 5 to 6 feet above Ordnance Datum. May be lowered 7 or 8 feet by pumping.

Seven tube-wells of 6 inches diameter, averaging about 25 or 26 feet in depth and reaching through gravel to Crag.

Not carried deeper because the Crag sand is very fine and therefore tends to block the bore-holes; and because it was not wished to depress the water-level much below Ordnance Datum, on account of the risk of getting chlorine.

An additional pumping station is being planned, to be in field 274, and eight trial-holes have been made.

The level of the ground varies from 10 to 18 feet above Ordnance Datum, and the level of the standing water is about 3 to 4 feet above Ordnance Datum.

Seven of the holes have been carried down about 30 feet in sand or sand and gravel; but here with no clear evidence of Crag. The other has been carried to a depth of 50 feet and some trace of shells has been found.

Rickenhall Inferior.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Black Swan Inn, from Mr. WARREN.
Brickearth, 10 feet.

Ringsfield.

(Ordn. Map 176, N.S.; Geol. Map 66 S.E.)
Information got by C. REID.
Clay, over 52 feet. Water from a land-spring.

Risby (RECTORY, 1898).

(Ordn. Map, N.S., sheet 189; Geol. Map 51 N.E., S.E.)
Made and communicated by Messrs. MERRYWEATHER.
Diameter of bore 6 inches. Depth of tube 41 feet.
Water level 130 feet down.

Clay and flints	33	150 feet.
Chalk - -	117	

Rougham (ALMS HOUSE).

(Ordn. Map 189, N.S.; Geol. Map 50, S.W.)
Communicated by Mr. WARREN.

Boulder Clay	70	90 feet.
Sand - -	20	

Rushmere.

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)
Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 382 (1840).

Loam -	14	66 feet.
Crag sand	52	

St. John Ilketsal.

(Ordn. Map 176, N.S.; Geol. Map 66 S.E.)

1. NEW HOUSES on Halesworth Road (noted 1881, or earlier).
Communicated by Mr. LAWRENCE.
Sixty feet of Clay. Water within 25 feet of the surface.

2 RECTORY.

Information got by C. REID.

Clay and brickearth, about	6	40 feet.
Sand - - - - - -	34	

St. Margaret Southelmham.

(Ordn. Map 176, N.S.; Geol. Map 50 N.E.)
Communicated by Mr. D. PALMER.

1. Mr. Freestone's. Two wells, not 200 yards apart, 120 feet of [Boulder] Clay to sand. In one the water rose to within 60 feet of the surface.

2. The Rectory. About 80 feet of [Boulder] Clay.

3. Southelmham Hall. [Boulder] Clay 10 feet, sand 60 feet.

Saxham, *see* Great and Little Saxham.

Saxmundham.

(Ordn. Map 191, N.S.; Geol. Map 50 S.E.)

1. Messrs. WALLER'S BREWERY, 1876.

Surface-level 45 feet above the sea.
From information on the spot by Mr. W. H. DALTON.
Water rises to 12 feet from the surface.

		Thickness.	Depth.
		Ft.	Ft.
Red Crag.	Sand - - -	80	80
	Red shelly Crag -	6	86
	Bluish-black Crag -	19	105
Reading Beds 21 feet.	Stiff blue clay -	19	124
	Stiff green clay -	1½	125½
	Stiff brown clay -	½	126
Chalk - - - - - - -		53	179

The account furnished by Messrs. BENNETT, of Ipswich, varies but slightly from the above, as follows:—

	Thickness.	Depth.
	Ft.	Ft.
Old well - - -	—	16
Red running sand -	59	75
Crag - - -	30	105
Clay - - -	21	126

Messrs. BENNETT showed me specimens of brown sandy clay from 105 and 107 feet deep, and of green sandy clay and green-coated flints from just above the Chalk. W.W.

2. For the Urban District Council. 800 yards westward of the centre of the town, adjoining the road to Rendham. 1905.

Communicated by Mr. P. F. MACKENZIE-RICHARDS. (Notes in brackets from specimens.)

100 feet above Ordnance Datum. Boring of 10 inches diameter.

Water from the Chalk, hard. Rest water-level 69 feet down. Tested in August, 1905, on completion of boring, and found to yield not less than 5,000 gallons an hour.

			Thickness.		Depth.	
			Ft.	in.	Ft.	in.
Soil			1	6	1	6
[Glacial Drift.]	Boulder Clay (pale grey)		30	6	32	0
	[Sands of the Drift.]	Red Crag, sand (light-brown)	45	4	77	4
		Light-coloured sand (buff)	4	0	81	4
		Red sand (bright brown)	6	6	87	10
		Light-coloured fine sand (buff)	4	0	91	10
		Red sand (light-brown)	8	6	100	4
		Grey sand	3	0	103	4
[Norwich or Red Crag, over 63 feet.]	Sand shells and flints (the last are thin sandstones). Water first found		4	0	107	4
	Sand (grey) and shells		7	0	114	4
	Grey sand and shells		5	0	119	4
	Shelly sand, consolidated (by iron)		30	8	150	0
	Dark sand and shells, consolidated (by iron)		14	6	164	6
	Flints (some pebbles, some green-coated some phosphatic nodules)		2	0	166	6
Chalk			65	0	231	6

The shells much broken up. Mr. H. A. ALLEN has determined the following :—

Buccinum.
Cerithium.
Trophon.
Cardium.
Mya arenaria, *Linn.*
Mytilus edulis, *Linn.*
Pecten opercularis, *Linn.*
Pectunculus glycimeris, *Linn.*
Tellina obliqua, *J. Sow.*
Balanus.
Heteropora pustulosa, *Buck.*

This section shows a depth to the Chalk 40 feet in excess of that at the brewery-well, and here this depth is all through Drift and Crag, whereas at the brewery a thickness of 21 feet of Reading Beds was found. We have therefore a hollow of Drift and Crag cutting through the older Tertiary beds into the Chalk, and this perhaps explains the occurrence of green-coated flints (from the base of the Reading Beds) in the nodule-bed of the Crag.

Semer.

(Ordn. Map 207, N.S. ; Geol. Map 48 N.W.)

1. The Rev. W. B. CLARKE, *Trans Geol. Soc.*, ser. 2, vol. v., p. 374 (1840).

Gravel 50 }
Chalk 22 } 72 feet.

2. Rectory.

Sunk and communicated by Mr. Pettit, of Hadleigh.

Chalky clay - -	10	30 feet.
Sand and gravel	10	
Chalk - - -	10	

Shipmeadow (Rectory).

(Ordn. Map 176, N.S.; Geol. Map 66 S.E.)

Information got by C. Reid.

Clay - - -	about 25	60 feet.
Sand and gravel	" 35	

Shotley.

(Ordn. Map 224, N.S.; Geol. Map 48 N.E.)

1. Fison's Brickyard, 1883.

Made and communicated by Messrs. Bennett, of Ipswich.

Well 17 feet, the rest bored, 5 inches diameter.

Water rises to within 15½ feet of the surface, not quite pure in quality.

		Thickness.	Depth.
		Ft.	Ft.
[Red Crag ?]	Loose sand - - - - - -	17	17
[London Clay, 8 feet.]	Dark loam - - - - - -	2	19
	Clay - - - - - -	1	20
	[? Basement-bed] (or ? trace of Old-haven beds.) Light-coloured blowing sand	3½	23½
	[? Basement-bed] (or ? trace of Old-haven beds.) Small pebbles -	1½	25
[Reading Beds, 45 feet.]	Blowing sand - - - -	12½	37½
	Dark blue clay - - - -	1½	39
	Light-blue clay - - - -	2	41
	Light-coloured loamy sand - -	3½	44½
	Mottled clay - - - -	4½	49
	Blue clay - - - - -	2	51
	Mottled clay - - - -	6	57
	Grey loam - - - - -	1	58
	Light-coloured sand - - -	½	58½
	Green loamy sand - - -	1½	60
	Dark brown loam - - -	1	61
	Bright yellow sand - - -	1½	62½
	Mottled sand or loam - - -	2	64½
	Mottled clay - - - -	2	66½
	Green clay - - - - -	2	68½
	Green clay and brown flints -	1½	70
Chalk - - - - - - - - - - -		30	100

Additional particulars from the Admiralty:

About 50 feet above Ordnance Datum.

Water-level at rest 15 feet down, after pumping 19 feet.

Water brackish. Yield 600 gallons an hour. In the reservoir-well the yield, with a large pump, is estimated at 6,000 gallons an hour.

2. West Valley, close to the Orwell. Trial-boring, for the Marquis of Bristol, 1900 (?).

Made and communicated by Mr. F. Bennett, and from Mr. T. Miller, of Ipswich.

Timber-shaft 14 feet, the rest bored (July 12th–18th).

		Thickness.	Depth.
		Ft.	Ft.
Soil		¾	
[London Clay.]	Brown clay	2	2¾
	Light-coloured loamy sand	5¼	8
	Brown clay	6	14
	London Clay, with 3 inches of soft rock at the base	3¾	17¾
	Blue clay, with 3 inches of hard rock at the base	7½	25¼
	Close blue clay	21¼	46½
	Dark loam	3½	50
	Light-coloured loam	7	57
	Stiff brown clay	5	62
	Light-coloured loam	6	68
[Reading Beds, 32 feet.]	Mottled clay	3½	71½
	Light-coloured stiff loam	3	74½
	Strong blue clay	1½	76
	Strong brown clay and marl	4½	80½
	Mottled clay	8½	89
	Mottled loam	3½	92½
	Green loam	1	93½
	Mottled clay, bright red and green	4½	98
	Green clay, with flints	2	100
Hard chalk and flints		4	104

3. Field next Brick Tower Windmill, 200 yards from the Rectory. For the Marquis of Bristol. 1904.

Made and communicated by Mr. F. Bennett.

		Thickness.	Depth.
		Ft. in.	Ft. in.
Well (old), the rest a boring (9 in. diam. down to 322) [chiefly through Drift Gravel and Red Crag]		—	35 0
[London Clay.]	Clay, with rock from 71½ to 72½, and from 77 to 78⅓	64 6	99 6
	Dark loam, with rock 101½ to 102⅔	4 0	103 6

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[Reading Beds, 45¼ feet.]	Stiff mottled clay	5	6	109	0
	Light-brown loam	1	4	110	4
	Very hard sand-pan	0	7	110	11
	Light-brown loam	4	0	114	11
	Light-coloured mottled loam	1	3	116	2
	Dark mottled loam	1	9	117	11
	Loam sand	4	0	121	11
	Sand-pan	0	4	122	3
	Sand	2	0	124	3
	Sand-pan	0	5	124	8
	Dark loam sand	1	0	125	8
	Sand-pan	0	3	125	11
	Stiff mottled loam	1	9	127	8
	Stiff mottled clay	15	10	143	6
	Brown clay	2	6	146	0
	Stiff green loam	1	6	147	6
	Flint-bed	1	3	148	9
Chalk. Hard and very little water. Flints		351	3	500	0

This section being on higher ground than the two sections above, the depth to the Chalk is naturally greater.

Somerleyton.

(Ordn. Map 162, N.S.; Geol. Map 67 S.W.)

1. Somerleyton Hall.

The well is 9 feet in diameter and 55 in depth, and the level of the water in it remains at 8 feet above the bottom, except when pumped. From 7,000 to 8,000 gallons a day used.

Another well near the Rosery in the grounds.

[Glacial Drift.]	Sand	50	60 feet.
[Pebbly Series.]	Coarse gravel	10	

2. At the Village Green.

[Glacial Drift.]	Stony loam	15	45 feet.
[Pebbly Series.]	Sand and gravel	30	

Another well, with a pump, from 50 to 60 yards from the above, is from 45 to 47 feet in depth. Some pipe-clay (Chillesford Clay ?) near the bottom.

3. Mr. Hubbard's Cottages.

Said to have been sunk through sand, to a depth of 61½ feet.

4. Two Wells about ¼ mile S. of the Church.

[Pebbly Series.] Sand and gravel, about 30 feet.

The well-sinker who gave the above information stated that the water in the neighbourhood of Somerleyton is generally met with in clean sand, lies at one level, and only varies a foot or two feet in dry and wet weather. When a well gets dry, a wooden tub is sometimes driven about 2 feet into the bottom, and water obtained by that means. J. H. Blake.

Sotherton (Cottages about ¾ mile S.W. of the Church).

(Ordn. Map 176, N.S.; Geol. Map 50 N.E.)

Sunk and communicated by Mr. J. Dade, of Wrentham.

About 4 feet of water.

[Glacial Drift.]	[Boulder] Clay, about	30	71 feet.
	Sand	40	

Sotterly (Brickyard. About 1869.)

(Ordn. Map 176, N.S.; Geol. Map 49 N.W.)

Communicated by Mr. S. V. Wood, Junr., from information from workmen in the pit, and from examination of material brought out.

		Ft.	Ft.
Glacial Drift.	Red earth, the same as in the pit, with occasional sand-galls as big as a small cask. Lower part a little freer from stones - - - - -	25	25
	Yellowish-white sand with small shingle - -	4	29
Chillesford Clay; with micaceous grains abundant, varies in thickness up to - - - - - - - - - -		7	36
Sand, slightly gravelly [Crag] to water - - - - -		4	40

Southelmham, *see* St. Margaret Southelmham.

Southwold.

(Ordn. Map 176, N.S.; Geol. Map 49 N.W.)

1. Market Place.

Sunk and communicated by Mr. J. Dade.

Sand and gravel [Pebbly Series] 45 feet; with about 5 feet of water.

2. Waterworks. On the Common. 1886, 1887.

About 40 feet (? more) above Ordnance Datum.

Made and communicated by Messrs. Le Grand and Sutcliff. (Notes from an examination of specimens, on the spot, by Mr. C. Reid in these brackets) and [Notes by W. W. in these].

Some particulars from a Report entitled "Southwold and its Water Supply."

A boring, with a tube of 6 inches diameter, carried down to a depth of 220 feet; and then one of 5 inches diameter well into the Chalk.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Ballast [Pebbly Series]. Water found at 34 feet -		37	0	37	0
[Crag, 147 feet.]	Dark yellow (red) sand - - -	8	0	45	0
	Dark yellow, sand (with shells, stained red, *Cardium edule?*, *Cyprina Islandica*, *Littorina rudis*, *Melampus pyramidalis*) - - - - -	33	0	78	0
	Dark yellow (red) sand - - -	6	0	84	0
	Light-yellow sand with black pebbles (flint and hard veined grit) and shells (*Mya truncata*, *Tellina obliqua*, *Littorina littorea*) - - - - -	6	0	90	0
	Light-grey sand (silty, full of mica) -	18	0	108	0
	Light-greenish blowing sand (the colouring matter seems to be small grains of phosphate, and not glauconite) - - - - -	56	0	164	0
	Light-greenish loamy sand, with shells (*Pecten opercularis*, *Natica*, etc.) -	2	0	166	0
	Dark stiff clay (hard, brown) - -	10	0	176	0
	Grey loamy sand and shells (sandy silt, with worn shell-fragments. *Balanus crenatus?* *Salicornaria crassa*, etc.)-	8	0	184	0

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[London Clay, 68½ feet.]	Dark clay and stones (soft greenish clay, with harder clay nodules) [specimen light-grey, and light in weight, not like London Clay] -	1	0	185	0
	Dark (brown, hard) clay [a specimen, from the top part ?, micaceous, which is not a character of London Clay-	23	0	208	0
	Stone [septaria] - - - - - -	1	2	209	2
	Dark (brown, hard) clay - - -	6	0	215	2
	Stone (septaria) - - - - - -	1	0	216	2
	Dark (brown), hard clay - - -	5	0	221	2
	Stone (septaria) - - - - - -	1	4	222	6
	Dark (brown, hard, rather more sandy) clay; in the bottom 10 feet mixed with some very fine glistening sand (a pebble seen, from the bottom, and the foreman said that so few were found that their occurrence was not noted) - - - - - - -	30	0	252	6
[Reading Beds, 70½ feet.]	Mottled clay [specimen light-grey and red] (Mr. Reid notes black and red)-	10	0	262	6
	Dark (greenish) grey loamy sand [specimen, fine, brownish-grey, compact] -	7	0	269	6
	Dark clay (hard, mottled dark blue and green, for top 7 feet, rest not seen). [Specimens, dull brown clay, with green specks] - - - - - -	40	0	309	6
	Chocolate-brown clay - - - - -	5	0	314	6
	Greenish sandy clay [specimen dark greenish grey, at 315] - - -	8	6	323	0
Chalk, soft, white, with a few flints - - - -		256	0	579	0

The Chalk caved in at this depth so that no further progress could be made without lining the bore. The water found in the Chalk found was small in quantity and not satisfactory in quality (brackish). The saltness of the Chalk-water in deep borings near the Essex and Suffolk coast is remarkable.

Later (the water from the Crag having been found to be very good) a shaft (cylinders and brickwork) was made, to the depth of 60 feet. "Pumping operations were continued for a considerable period both night and day, and it was found impossible, although water was pumped at a greater rate than would suffice for the supply of the district, to lower the water beyond a level of 18 feet from the bottom of the cylinders." From the Report above noted (1888).

Mr. J. M. Wood tells me (1905) that the boring was plugged and that as the water in the well, from the Pebbly Series and the Crag, when lowered by pumping was found to contain a large amount of chlorine (pointing to infiltration from the sea) besides a trace of organic matter, the well is practically abandoned, except for fires and sanitary purposes. The present supply is got from Reydon (see p. 100).

Stanningfield.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)

1. Information got by F. J. Bennett.

Boulder Clay, to sand and water, which stands 50 feet up, 135 feet.

2. Half a mile N. 15° E. of the church, at the spot marked 'Well' on the 6-in. map (in error, as there was only a pit there). 1894.

Communicated by the Rev. E. Hill, from information from the owner, Mr. Crossfield, verified by inspection.

310 feet above Ordnance Datum.

Sunk to the depth of 111 feet, when water rose to 56 feet from the surface.

Wholly through grey chalky Boulder Clay, with chalk-pebbles (some scratched), large flints, fragments of Kimeridge Clay and of *Ammonites*. The flints and Kimeridge Clay occurred noticeably at the depth of 60 to 80 feet.

Stansfield.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)

1. Assington Green (Aston End Green of old map). 1896.

Shaft, made and communicated by Mr. G. Ingold.

Water at 50 feet. Strong spring.

		Thickness.	Depth.
		Ft.	Ft.
Mould		1	1
Drift	Brown clay	12	13
	Blue clay	26	39
	Chalky gravel	13	52

2. Church Farm (by the Church).

Boulder Clay, 80 feet; Chalk, 40 feet. F. J. Bennett.

3. Upper Street, for Public Supply. 1895.

Made and communicated by Mr. G. Ingold.

302 feet above Ordnance Datum.

Shaft 101½ feet, the rest bored. Water rose to within 94½ feet of the surface. Supply ample.

		Thickness.	Depth.
		Ft.	Ft.
Mould		2	2
[Drift.]	White clay	1½	3½
	Loamy sand, with water	1	4½
	Blue and brown clay	8½	13
	Dark grey sand	4	17
	Blue clay. Large boulder at 60 feet. Sandy veins at 101½ feet	91	108
[? Drift or Reading Beds.]	Mottled clay	13	121
	Pale-green sand	3	124
Yellow Chalk		12	136

The description of the two beds next above the Chalk reads as if a patch of Reading Beds had been found beneath the Drift.

A similar suggestion of the presence of Reading Beds under the Drift beyond where they have been mapped, was given by a well at Foxearth, in Essex, (see *Essex Naturalist*, 1892 vol. vi., p. 51) and that is the nearest record of any such occurrence, the mass of the Eocene Tertiaries being more than 7 miles from Stansfield, at the nearest, while Foxearth is over 5 in the same direction (south-east).

Should the beds just above the Chalk in these cases prove to be Eocene, it will show how doubtful it is what next underlies the thick Drift in many places in these parts.

Stanstead. Kiln Farm, a mile E. of the church.

(Ordn. Map 206, N.S.; Geol. Map 51 S.E.)
From Mr. A. J. Jukes-Browne's Notes.
Said to be through Boulder Clay into sand and gravel, 30 feet.

Stanton (The Rose and Crown Inn).

(Ordn. Map 189, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Warren.

Gravel	20	60 feet.
Chalk	40	

Stoke Ash.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Day.

	Windmill.	Wood Hall.	White Horse Inn.
[Boulder] Clay	35	56	10
Sand	3	4	25
Water rose	1	6	2

Stoke-by-Clare.

(Ordn. Map 206, N.S.; Geol. Map 47.)

1. Clare College.

Communictated by Dr. J. C. Thresh, from particulars given by the late Lord Loch, 1900.
235 feet above Ordnance Datum.
Water-level 72 feet down. Yield about 5,000 gallons a day.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift]	Blue [Boulder] Clay	42	42
	Yellow clay and sand	1	43
	Sand	11	54
	Gravel	1	55
	Red clay and sand	5	60
	Gravel	1	61
	Flints	2	63
	Red sand	1½	64½
Chalk	Yellow chalk	26	90½
	Red [? brown-stained] chalk	49½	140

2. NEAR THE RAILWAY STATION.

From observation by W. H. PENNING.

To Chalk, about 24 feet.

Water stands about 3 feet below the top of the Chalk.

Stoke (BY IPSWICH), *see* Ipswich.

Stoke-by-Nayland. IN THE VILLAGE.

(Ordn. Map 224, N.S.; Geol. Map 48 N.W.)

Sunk and communicated (from memory) by Mr. KINGSBURY.

Brick earth -	5	69 feet.
Sand and gravel	64	

Stonham Aspal.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

J. B. PHEAR, *Trans. Camb. Phil. Soc.*, vol. ix., pt. iv., p. 442 (1856).

Two wells, respectively 45 and 90 feet of Drift clay, over red sand.

Stonham. BREWERY (2 wells).

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

J. B. PHEAR, *Trans. Camb. Phil. Soc.*, vol. ix., pt. iv., p. 438.

Flat alluvial deposit, to gravelly bed with a perpetual spring, at a depth of 10–15 feet.

Stonhams. THE FOUR.

Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377 (1840).

Diluvial clay from 60 to 80 feet.

Stow, *see* West Stow.

Stowlangtoft. THE HALL.

(Ordn. Map 189, N.S.; Geol. Map 50 N.W.)

Sunk and communicated by Mr. WARREN.

[Boulder] Clay	10	30 feet.
Chalk - -	20	

Stowmarket.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

1. Brewery, in the middle of the town (? before 1850).

From a drawing and description, with a few specimens, entitled "Geological Puzzle for Suffolk," by Prof. J. S. Henslow, in the Ipswich Museum, and J. B. Phear, *Trans. Camb. Phil. Soc.*, vol. ix., pt. iv., p. 439 (1856).

		Thickness.	Depth.
		Ft.	Ft.
[Drift]	Gravel	7	7
	Sand	2	9
	Wet loamy brick-clay	4	13
	Common brick-clay	13	26
	Blue [Boulder] clay, light-coloured at first, then dark, then dark with chalk-lumps	27	53
	Beach-sand, with recent marine shells, and strong smell of sulphuretted hydrogen; hard water	18	71
Chalk, the top 10 feet soft, the rest hard		250	321
Green sand or sandstone. "In a sand-bed in the Chalk, or an incursion from above the Chalk into an oblique fissure?"		9	330

[The specimens from the "beach-sand" are *Tellina soliduta*, *Trochus cinerarius*, *Purpura lapillus*, *Nassa*, *Turritella* ?, and small pebbles and phosphatic nodules "derived from detrital materials in the red crag," of which formation there may, therefore, be a trace at the bottom. The shells are, as stated, recent. Did they all come from the well ?]

Lord Francis Hervey wrote in 1895, that soft water, of a constant temperature of 50°F. was got.

2. Brickyard, a quarter of a mile W. of the Church.

From information on the spot. (J. H. Blake.)

Good supply of water, which rose 50 feet in half an hour.

Brickearth	about	30	113 feet.
Chalky Boulder Clay	„	73	
Sand, bored into	„	10	

3. Messrs. Cobbold's Malting, about 100 yards W. of the Railway Station. 1884.

Bored and communicated by Messrs. Bennett, of Ipswich.

Water rose to within 1 foot 9 inches of the surface, several feet above the level of the river, near by.

Tubes driven 15½ feet into the Chalk.

		Thickness.	Depth.
		Ft.	Ft.
Depth of well [? old]		—	17
[Drift and Crag ?]	Light-coloured clay	15	32
	Light-coloured running sand	9	41
	Light-coloured clay	2	43
	Running sand	1½	44½
	Light-coloured loam	1½	46
	Very light-coloured Crag	1½	47½
	Septaria	½	48
	Crag and sand	9	57
	Green-coated flints	½	57½
Chalk		52½	110

4. Messrs. Greene, King and Co. Waterworks, since 1895.

Made and communicated by Messrs. Le Grand and Sutcliff.
Water-level 24 feet 10 inches down.

		Thickness.	Depth.
		Ft.	Ft.
Basement		—	8½
[Drift]	Loam	9	17½
	Blue clay	31½	49
	Blue clay, chalk-stones and pebbles	14	63
	Grey sand	2½	65½
	Sand, fine and coarse shells, stones of flint and chalk	12	77½
[Upper Chalk]	Dirty chalk and flints	25½	103
	Chalk and flints	27	130
	Hard chalk and flints	28½	158½

5. Mr. W. R. Hewitt's Mill. 1867.

Sunk and communicated by Mr. T. Tilley.
Supply abundant.

		Thickness.	Depth.
		Ft.	Ft.
[Drift]	Loam, sand, and gravel	20	20
	Sharp sand with stones and lumps of quartz	80	100
Chalk	Rubbly chalk and flints (very loose), with much water	200	300
	Very hard chalk about	15	315

6. From the same authority we learn that at the Paper Mills the section is about the same, but it is only 50 feet to chalk, and that at Mr. Prentice's Mill it is 72 feet to chalk, in both cases the sand being less sharp.

7. The Rev. W. B. Clarke notices a well here, but in Drift only (dark stiff clay 16 feet; sand 54 feet), though he classifies the beds as London and Plastic Clays. *Trans. Geol. Soc.*, ser. 2, vol. v., p. 378 (1840).

Stow Upland. Near

(Ordn. Map 190, N.S. ; Geol. Map 50 S.W.)
Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 378.
Diluvial [Boulder] clay, to sand and water, 105 feet.

Straddishall.

(Ordn. Map 206, N.S. ; 6-in. Map 62. Geol. Map 51, S.E.)
From Mr. WARREN. Boulder Clay, 90 feet.

1. THE HALL (?The Place).

2. PUBLIC WELL. 1893.

Made and communicated by Mr. G. INGOLD.
Shaft. Water-level 35¾ feet down.

		Thickness.	Depth.
		Ft.	Ft.
Mould		2	2
Loamy sand		2	4
[Boulder Drift]	White clay	5	9
	Brown clay	4	13
	Blue clay	47	60
Chalk		9	69

Stuston. CHINERY'S BRICKYARD.

(Ordn. Map 175, N.S. ; Geol. Map 50 N.W.)
Sunk and communicated by Mr. G. BANHAM.
Water rose 6 feet.

[Boulder] Clay	2	33 feet.
Sand	4	
Chalk	27	

Stutton. THE HALL. About 1⅓ miles S. of W. from the Church.

(Ordn. Map, N.S,, 224 ; 6-in. Map, 88 ; Geol Map 48 N.W.)
Communicated by Mr. G. F. MANSELL.

		Thickness.	Depth.
		Ft.	Ft.
Soil		3	3
Gravel		10	13
[London Clay, 71 feet]	Coloured clay	4	17
	Blue clay	12	29
	Sandy clay	55	84
[Reading Beds, 53 feet]	Mottled clay, with claystone (3 inches) 2 feet down	12¼	96¼
	Stone	1	97¼
	Green clay and sand	24¾	122
	Dark clay	7	129
	Clay and a little sand	7¼	136¼
	Flint and pebbles	¾	137
Chalk and flint		63	200

Sudbury. Waterworks, north of the town.

(Ordn. Map 206, N.S.; Geol. Map 47.)
Communicated by Mr. T. Hennell. And from information on the spot.
Shaft about 70 feet, the rest bored.
Water stands 17 feet up in the shaft, and is pumped down 8 feet.

		Thickness.	Depth.
		Ft.	Ft.
Soil		4	4
Drift	Gravel	10	14
	Loam	20	34
	Blue clay with sand-veins [some of this, lying about, is Boulder Clay]	37	71
	Crust of hardened sand	½	71½
	Sand	1	72½
Chalk		? 206	278

In a discussion Mr. T. W. A. Hayward said, "In 1869, when the waterworks were established in the town, they obtained a plentiful supply . . yielding about 50,000 gallons an hour. That supply was regular until 1884, when there was an earthquake, and the flow was diminished to 30,000 gallons an hour until 1899, when he was surprised to find the water again increasing in quantity. What Sudbury lost they gained at Colchester, but now that the Sudbury water had come back the Colchester water had diminished." *Trans. Brit. Assoc. Waterworks Eng.*, vol. viii., p. 129 (1904).

Swilland. For Public Supply. At a new Farm House.

(Ordn. Map 207, N.S.; Geol. Map 50, S.E.)
From Mr. G. S. Elliston's Annual Report on the Bosmere and Claydon Rural District (1894 ?).

Boulder Clay sunk through at the depth of 94 feet, but the water could not be used, as it is said to be contaminated with organic impurities.

Thelnetham. White Horse Inn.

(Ordn. Map 175, N.S.; Geol. Map 50 N.W.)
[Boulder] Clay 60 feet.

Thetford. Waterworks. In Norfolk. *See* Memoir, noted on p. 165.

Thorndon.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Day, 1–3. By Mr. Warren, 4.

1. Black Horse Inn.

[Boulder] Clay 53
Sand 2 } 55 feet.

2. The Rectory, and 3. Hill House.

[Boulder] Clay 55
Sand 20 } 75 feet.

4. The Hall. [Boulder] Clay 30 feet.

5. The Reformatory.

Made and communicated by Messrs. Isler (and from specimens seen by Mr C. Reid). The bore lined some depth into the Chalk.

Water-level 5 feet down. Supply, 16 gallons a minute.

		Thickness.	Depth.
		Ft.	Ft.
Dug well		—	14½
[Glacial Drift.]	Stony (Boulder) clay	13	27½
	Loamy (Boulder) clay	10	37½
	Light-coloured sand, with stones	3	40½
	Gravel stones	4	44½
	Sand and stone, with water	26	70½
	Live sand	1	71½
	Sand	2½	74
	Gravel (sandy Jurassic limestone, quartzite and quartz)	7½	81
	Sand and pebbles (sub-angular flints and quartz pebbles)	5½	87
Chalk and flints		93	180

Thorpe Morieux. Chinery's Farm.

270 feet above Ordnance Datum.
(Ordn. Map 206, N.S.; Geol. Map 50 S.W.)
Communicated by the Rev. E. Hill, from information from Mr. Cobbold.
Well 120 feet deep. "Mostly blue clay; sandy gall at bottom."
Specimens: at 80 feet iron sandstone; at 90 feet dark grey sandy rock, easily disintegrated, with shells (about 3 feet thick).

Thrandeston. Great Green.

(Ordn. Map 175, N.S.; Geol. Map 150 N.W.)
1. Sunk and communicated by Mr. Warren.
Water rose 4 feet in each.

[Boulder] Clay	40	42 feet.
Sand	2	

Sunk and communicated by Mr. Day.

[Boulder] Clay	15	37 feet.
Sand	15	
[Boulder] Clay to Sand	7	

Thurlow, *see* Great Thurlow.

Thwaite.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Day.

1. The Buck's Head Inn.

Water rose 15 feet.

Sand	15	45 feet.
[Boulder] Clay	27	
Sand and gravel	3	

2. Near the Buck's Head Inn.

Water rose 10 feet.
[Boulder] Clay, to Sand 34 feet.

Tostock.

(Ordn. Map 189, N.S.; Geol. Map 50, S.W.)
Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).
Gravel, 55 feet.

Trimley (Felixstow and Walton Waterworks. 1893.)

(Ordn. Map 225, N.S.; Geol. Map 48 N.E.)
Communicated by Mr. H. Miller.
Sixty feet above Ordnance Datum.
Iron cylinders 83 feet, the rest bored.
Water rose to 55 feet from the surface. Supply good. Quality excellent.

	Thickness.	Depth.
	Ft.	Ft.
Soil and Crag	8	8
[London Clay]. Clay and loam, with 7 inches of septaria 88½ feet down	81	89
[Reading Beds, 36 feet.] Mottled clay	18	107
Dark clay	9	116
Greenish sand	9	125
Chalk. Thin layers of flints 144, 161, 165, and 178 feet down.	116½	241½

Troston (Bull Inn).

(Ordn. Map 189, N.S.; Geol. Map 50, N.W.)
Sunk and communicated by Mr. Warren.
Loam, 37 feet.

Waldingfield, *see* Great Waldingfield.

Waldringfield (Cement Works, by the River Deben, just N. of the Bush Inn. 1881.).

(Ordn. Map 208, N.S.; Geol. Map 48 N.E.)
About 8 feet above Ordnance Datum.
Sunk and communicated by Messrs. Bennett, of Ipswich.
An excellent supply of good water, rising to within 7 feet of the surface.

	Thickness.	Depth.
	Ft.	Ft.
[? Alluvium] Depth of [old] well	9	9
[London Clay ?] Light-coloured loam	2	11
Brown clay	18	29
[Reading Beds] Dark loam	2	31
Blue clay	9	40
Mottled clay	2	42
Green sand	6	48
Clay	8	56
Light-coloured loamy sand	1	57
Clay	5	62
Green clay and brown flints	1	63
Chalk	62	125

It is difficult to make out the division between the London Clay and the Reading Beds.

Walsham-le-Willows.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Ten wells, sunk and communicated by Mr. WARREN.

100 yards N.W. of the Church.

Gravel - -	12	31 feet.
Chalk - -	19	

20 yards a little east of the above.

Gravel - -	12	19 feet.
Chalk - -	7	

THE BREWERY.

Gravel - -	12	24 feet.
Chalk - -	12	

FOUR ASHES, south-east of the Church.

Gravel - - - -	7	46 feet.
[Boulder] Clay - - -	24	
Sand and gravel, to Chalk -	15	

THE SIX BELLS INN. Running sand, 18 feet.

Close by the above. Gravel, to Chalk, 12 feet.

THE SCHOOL.

Gravel - -	7	17 feet.
[Boulder] Clay	10	

THE COFFEE ROOM.

Gravel - -	8	43 feet.
[Boulder] Clay	35	

A little east of the above.

Gravel - -	7	31 feet.
[Boulder] Clay -	24	

In the Village. [Boulder] Clay, 90 feet.

Many more wells in Walsham have been sunk through gravel into Boulder Clay at depths of from 18 to 25 feet.

Walton.

(Ordn. Map, N.S.; sheet 225; Geol. Map 48 N.E.)

1. GARRISON SPRINGS.

Communicated by Col. B. BRINE, R.E.

Water-level 18 inches above H. W. M. Water good, but hard. Good supply. According to a communication from the Admiralty the yield is 14,000 gallons a day.

London Clay, with hard septaria at 36½ feet (13 inches) at 51¼ feet (12 inches) - - - - - -	70	73 feet.
Dark loam [? Basement-bed] - - - - -	1½	
Running sand [? Reading Beds] - - - - -	1½	

Somewhat different details from Mr. F. Bennett, of Ipswich.

2. Landguard or Langer Fort. 1881–1884.

11·14 feet above Ordnance Datum.

From a drawing and specimens, communicated by Col. B. Brine, R.E.

Cylinders to 58 feet, the rest bored.

Very salt water at 227½ feet, which suddenly rose to 9 feet below the surface of the ground.

	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Sand and shingle. Pieces of septaria at over 36½, and over 46½ feet. Piece of calcareous tufa ? at nearly 44 feet. Pieces of calcareous sandstone at over 46½, and at 48 feet. Firm irony sand at 47 feet - - - - -	47	8	47	8
Clay, shingle and pieces of stone [cement-stones from the London Clay] - - - -	2	3	49	11
Hard sandstone (cement-stones, partly reddish and sandy) - - - - - - - -	1	9	51	8
Loamy clay, intermixed with sandstone. Specimens of brown clay, sandy clay, clayey sand, and sand ? partly hardened, and calcareous. Hard calcareous sandy stone at 54 feet - -	2	8	54	4
Stiff clay. Specimen of calcareous sandy stone at 54½ feet, the others brown and grey clay -	2	1	56	5
Loam, with some pieces of stone. Specimen of brown and grey clay just at the top, and of brown sandy clay at over 61 feet - - -	4	10	61	3
Stiff clay. Specimens; at 64½ and 67 feet, dark brown and reddish clay; at 78 feet blackish and grey clay, slightly mottled brown; at 86 feet green, red and purple clayey sand; at 86½ feet green clayey sand, partly brownish; at 87½ feet red, and green clayey sand or sandy clay; at 88½ feet purple and greenish sandy clay; at 91 feet green sandy clay, with small green-coated flints - - - - -	30	0	91	3
Flints. Specimens large and green-coated -	1	3	92	6
Soft white chalk with flints - - - -	115	0	207	6
Hard blocky white chalk with flints - -	228	0	435	6
Soft white chalk with flints - - - -	76	6	512	0
Knotty (? nodular) white chalk, with flints - Hard white chalk with flints - - -	82	0	594	0
Chalk [specimen of grey flaky chalk, probably from a marly layer, at 801 feet, and of white chalk at 805–9 feet] - - - - -	215	0	809	0

It seems as if the London Clay ends with the loam at 61¼ feet, the Reading Beds beginning with the stiff clay below, and being therefore 31¼ feet thick.

An earlier attempt (1877) at a distance of over 50 feet gave a slightly different section, and brackish water was then got at 109 feet, rose to about 9 feet befow the surface, and was inexhaustible. The information, additional to the above, given by this well was as follows :—

	Thickness.	Depth.
	Ft.	Ft.
Shingle and sand, with fresh water - - -	44½	44½
London Clay. Specimens of rather sandy brown clay at 73 and 80 feet. Dark brown sandy clay at the bottom - - - - - -	38½	83
Reading Beds. Specimens; brown sandy clay with a tinge of green at 83½ and 84½ feet; brown greenish and reddish sandy clay at 85; greenish and reddish sandy clay at 87; the like, stiffer, at 88; green and brown (or red) sandy clay at 89 - - - - - - -	10	93
Chalk, with broken flints (some green-coated at the top) - - - - - - - -	93 (? more)	186?

Judging by this latter well, from which better specimens were got, the division between the London Clay and the Reading Beds should be higher.

Wattisfield (at the Kilns).

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Warren.

Brickearth -	8	40 feet.
Chalk - -	32	

Wattisham (Opposite the gate to the Hall).

(Ordn. Map 207, N.S.; Geol. Map 50 S.W.)

Communicated by the Rev. E. Hill, from information from Mr. E. S. Cobbold.

Road-level about 285 feet above Ordnance Datum.

Well 80 feet deep, mostly through stiff blue [Boulder] clay.

West Creeting.

(Ordn. Map 190 N.S.; Geol. Map 50 S.W.)
Communicated by Col. J. Hasted.

[Boulder] Clay -	119½	121 feet.
Sand, to chalk -	1½	

Westerfield (Brewery).

(Ordn. Map 207, N.S. ; Geol. Map 48 N.E.)
Sunk and communicated by Messrs. Bennett, of Ipswich.
Water-level about 105 feet down. Supply good.

		Thickness.	Depth.
		Ft.	Ft.
[Drift.]	Clay and marl [? Boulder Clay]	9	9
	Stone and coarse sand - -	6	15
[Drift and Crag ?]	Clean coarse sand - - -	12	27
	Fine sand - - - -	7	34
	Fine grey sand - - -	3	38
	Fine sand - - - -	2	39
	Fine loamy sand - - -	½	39½
	Fine running sand - - -	1½	41
	Red running sand - - -	11	52
[London Clay ?]	Brown clay - - - -	1	53
	London clay - - - -	24	77
[Reading Beds, 30 feet.]	Mottled red clay - - -	8	85
	Light-coloured clay - -	9	94
	Light-coloured loamy sand -	8	102
	Green clay and brown flints -	5	107
Chalk - - - - - - - - - -		80	187

Westhorpe (Half-a-mile south of the Village).

(Ordn. Map 190, N.S. ; Geol. Map 50 N.W.)
Sunk and communicated by Mr. Warren.
[Boulder] Clay, 40 feet.

Westleton.

(Ordn. Map 191, N.S. ; Geol. Maps 49 N., 50 N.E.)
1, 2, 3 from information on the spot.

1. Windmill at the northern end of the village. 80 feet of white sand.

2. House nearly half a mile E. of the church, on the northern side of road. Said to be the same ; but there must be some loam or Boulder Clay and a little gravel at the top.

3. Windmill, marked on the old map, nearly half a mile S.E. of the church, 45 feet of gravel, to sand and water.

4. Mr. Grimsey's Farm, St. Helena, about a mile N.W. of Dunwich. 1904.
Made and communicated by Mr. C. R. Cole, of Lowestoft.
Water-level 51 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Soil - - - - - -		2½	2½
[Pebbly Series ?]	White sand -	14½	17
	Iron-pan - -	1½	18½
	Yellow sand -	8	26½
[Chillesford Beds?]	Hard loam -	5	31½
	Red sand - -	15	46½
	Loam and clay	2½	49
[Red Crag.]	Red coarse sand	6	55

One cannot be certain as to the presence of Chillesford Beds.

Westley.

From Mr. Warren.

1. Brickyard, near Manure Works. Boulder Clay, 20 feet; Chalk 90 feet.
2. Manure Works (Chemical Works on Map). Chalk, 90 feet.

Weston (For new cottages, about a quarter of a mile E. of N. from Hungry Hill Farm. 1898).

(Ordn. Map 176, N.S.; 6 in. Map 18; Geol. Map 50 N.E.)
Communicated by Mr. R. H. I. Palgrave.
Water got at the bottom.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift.]	Boulder Clay.] Common yellow clay [weathered Boulder Clay] - - - -	2	2
	Boulder Clay.] Dark stiff clay, chalky - - -	8	10
	Boulder Clay.] Very stiff blue clay, chalky Boulder clay - - - -	13	23
	Sandy gravel - - - - -	5	28
	Loamy brick-earth [? Lower Boulder Clay] - - - - -	3	31

There are also wells at the Railway Gate House (64 feet), at Old Farm (35 feet), at Grove Farm (72 feet), and at Hungry Hall (77 feet), water being found near the bottom, but so impregnated with iron as to be useless for household-purposes, whilst at the other three wells good water is got.

West Stow.

(Ordn. Map 189, N.S.; Geol. Map 51 N.E.)

1. Heath [? Field]. A mile north of the church.
From Mr. Warren.
Sand, 30 feet.

2. Bury St. Edmunds Sewage Farm. By the road on the heath 1¼ miles W.N.W. of the church, 1904.

Communicated by Mr. G. R. Strachan.
63 feet above Ordnance Datum. A borehole of 4 inches diameter, tubed into the Chalk.

		Thickness.	Depth.
		Ft.	Ft
[Post Glacial Drift.]	Sand - -	20	20
	Gravel - -	15	35
[Glacial Drift]	Boulder Clay	35	70
Chalk - - - - - -		20	90

This section is at about the edge of the Drift, on the map, and seems to show therefore either that the Drift comes on very suddenly or else that its boundary should be extended northward here.

Wetherden.

(Ordn. Map 190, N.S.; Geol. Map 50 S.W.)

1 and 2. Information got by J. H. Blake.

1. About a mile N. of the church, on the western side of the road. Boulder Clay, 53 feet.
2. Bugs Farm, over 1½ miles N. of the church. Boulder Clay, 70 feet

3. Wetherden Hall, about a mile N.E. of the village.

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 376 (1840).

Diluvial [Boulder] Clay -	40	60 feet.
Sand - - - - -	20	

Wetheringsett (Farm midway between Blacksmiths Green and White House (eastward), about 1½ miles S.E. of the church.

(Ordn Map 190, N.S.; Geol. Map 50 S.W.)
Information got by J. H. Blake.
Boulder Clay, 80 feet.

Whatfield.

(Ordn. Map 207, N.S.; Geol. Map 48 N.E.)

1. The Hall.

Sunk and communicated (from memory) by Mr. Pettit, of Hadleigh.

Chalky [Boulder] Clay -	60	101 feet.
Chalk - - - -	41	

A well here is noted by the Rev. W. B. Clarke (*Trans. Geol. Soc.*, ser. 2 vol. v, p. 374) as through 40 feet of the Clay and 66 of Chalk.

2. For the Cosford Rural District Council. Since 1895.

Made and communicated by Messrs. Le Grand and Sutcliff.
126 feet above Ordnance Datum. Water-level 115 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Soil - - - - - - - - -		2½	2½
Boulder Clay -	Chalk, flints and blue clay	93	95½
[Upper Chalk] -	Chalk and flints - -	5	100½
	Putty chalk - - -	20½	121
	Soft block chalk - -	54	175

Whepstead (Brickyard).

(Ordn. Map 189, N.S.; Geol. Map 51 S.W.)
Information from Mr. Warren.
Boulder Clay. to sand and water, 40 feet.

Wherstead.

(Ordn. Map 207, N.S.; Geol. Map 48 N.E.)

Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 382 (1840).

Gravel -	3	49 feet.
Clay -	6	
Crag -	40	

Whitton (SPARROW'S NEST, 2 miles N. of Ipswich. 1875).

(Ordn. Map 207, N.S.; Geol. Map 48 N.E.)
Sunk and communicated by Messrs. BENNETT, of Ipswich.
Water rose to within 105 feet of the surface.

		Thickness.	Depth.
		Ft.	Ft.
Drift and ? trace of Reading Beds.	Depth of old well -	—	48
	Clay (blue) - -	24	72
	Sand (fine)- - -	1	73
	Blue clay - - -	21½	94½
	Coarse sand - -	8	102½
	Blue clay - - -	4	106½
	Hard rocky substance	½	107
Chalk - - - - - -		293	400

Wickhambrook (ASHFIELD GREEN, Mr Pryke's).

(Ordn. Map 206, N.S.; Geol. Map. 51 S.E.)
Information from Mr. WARREN.
Boulder Clay, to sand and water (which rose 70 feet), 130 feet.

Wickham Market.

(Ordn. Map 208, N.S.; Geol. Map 50 S.E.)
Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 377 (1840).

Blue Clay - -	50	160 feet.
Sand - - -	110	
Clay - - -		
Sands and gravel		
Chalk - -		

Wickham Skeith.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
On the Green. Sunk and communicated by Mr. DAY.

[Boulder] Clay	50	54 feet.
Sand - -	4	

Willisham.

(Ordn. Map 207, N.S.; Geol. Map 50 S.E.)
Two Wells, No. 2, at the Hall.
Rev. W. B. CLARKE, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 379

	(1.)	(2.)
Clay -	146	2 feet.
Chalk -	3	190 ,,

Withersdale (Glebe Well, east of the Church).

(Ordn. Map, N.S., 175; Geol. Map 50 N.E.)
Communicated by the Rev. I. I. RAVEN (1902).
Apt to run dry in summer.

[Glacial Drift.]	Gravel, etc. - - - - - -	30 feet
	Sand, like that of Yarmouth beach, with a good supply of water.	

Withersfield.

(Ordn. Map 205, N.S.; Geol. Map 51 S.E.)
Two Public Wells, made and communicated by Mr. G. Ingold.

1. Burton Green. 1885.

Shaft 122 feet; the rest bored.
Water-level 118½ feet down.

		Thickness.	Depth.
		Ft.	Ft.
[Glacial Drift (Boulder Clay to 100).	Brown clay	10	10
	Blue clay, with large boulders	33	43
	Light-blue clay, with chalk-stones	31	74
	Dark-blue clay, with stones	4	78
	Light-blue clay, with chalk-stones	22	100
	Brown sandy loam, with chalk	5	105
Chalk		55	160

2. Near the White Horse, 1885.

Shaft 95 feet; the rest bored.
Water-level 83 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Made earth		3	3
[Boulder Clay.]	Blue clay, with large boulders	6	9
	Blue clay, with chalk-stones	99½	108½
Chalk		51½	160

Witnesham.

(Ordn. Map 207, N.S.; Geol. Map 50 S.E.)
1. Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 379 (1840).

Clay	17	To chalk, 63 feet.
Gravel ?	46	

2. Communicated by the Rev. R. A. Bullen. Made by G. R. H. Allen, of Wickham Market, 1904.

		Ft.
[Drift.]	Boulder clay. Blue clay and chalk	76½
	Bright red sand	20
	White sand	
	Shingle and sand	
	Blue sand and water	

Woodbridge.

(1 in. Maps, N.S., 207, 208; 6 in. Maps, 67, 68, 76, 77; Geol. Maps, 50 S.E., 48 N.E.)

1. Castle Brewery (Messrs. Lockwood's). About 100 yards S.W. of St. Mary's Church, 1899.

Made and communicated by Mr. F. Bennett, of Ipswich.

Cylinders had to be used, owing to the running sands. 80 feet of tube (internal diameter 6 inches) driven to 83½ feet below the surface.

Good supply, from 8,000 to 9,000 gallons an hour.

		Thickness.	Depth.
		Ft.	Ft.
Made up soil		4	4
[Red Crag.]	Running sand	7	11
	Red Crag	4	15
Blue [London] Clay		31½	46½
[Reading Beds, 28 feet.]	Running sand	5½	52
	Brown clay	3½	55½
	Sandy loam	5	60½
	Light-coloured running sand	5	65½
	Sandy loam	5½	71
	Mottled clay	3½	74½
Chalk		120½	195

2. Mr. Combe's Malting on the top of the hill, near the Sun Inn, 1885.

Made and communicated by Messrs. Bennett.

Water rose to within 11 feet of the surface. A good supply.

		Thickness.	Depth.
		Ft.	Ft.
Shaft, partly in blowing sand (the rest bored)		—	13½
[? Crag]. Very fine running sand		9	22½
Blue [? London] Clay		2½	25
[Reading Beds.]	Running sand	14	39
	Mottled clay	2½	41½
	Running sand	1½	43
	Light-coloured loam	2½	45½
	Red mottled clay	5½	51
	Dark green clay with brown flints	1	52
Chalk, very white and clean		88	140

This section seems to bring the Reading Beds very near to the surface. Possibly the running sand that occurs 25 feet down may represent the sandy basement-bed of the London Clay; but on the other hand, the Reading Beds should perhaps be carried higher.

3. Farm ¾ mile N. of the church.

Communicated by Mr. S. V. Wood, Junr. 1881.
Water got at the bottom.

	Thickness.	Depth.
	Ft.	Ft.
Humus and sandy brickearth - - - -	2	2
White Boulder Clay, very chalky - - - -	4	6
Coarse sand, full of chalk-grains and small lumps of chalk, mostly very hard - - - - -	12	18
Sandy gravel, with but few large stones and many shell-fragments and small lumps of hard chalk, the last getting scarcer downward, and ceasing at the base - - - - - - - - - -	14	32
Sandy gravel with few stones (and those small); no shell-fragments or chalk - - - - -	21	53
Coarse sand with white grains (? chalk) - - -	12	65
Yellow gravel, more stones, but none large - -	5	70
More sandy gravel - - - - - - - -	6	76
Dark yellow sand without gravel - - - -	4	80
The same, darker and with some comminuted Crag	3	83

The last two beds were regarded by Mr. Wood as of Lower Glacial age, the Crag being remanié.

4. Messrs. Hart and Wrinch, maltsters, by the river, 1876.

Sunk and communicated by Messrs. Bennett, of Ipswich.
Water rises to 21½ feet below the surface. Good supply, 70 gallons a minute.

		Thickness.	Depth.
		Ft.	Ft.
Depth of old well (the rest bored) -		—	23½
[Reading Beds]	Fine sand - -	14	37½
	Mottled clay - -	6	43½
	Loamy sand - -	14	57½
	Dark clay - -	3	60½
	Brown flints - -	1	61½
Chalk - - - - - - -		78½	140

5. Mr. Hayward's Steam Flour Mill, close to the Gasworks, 1874.

Sunk and communicated by Messrs. Bennett, of Ipswich.
Good supply; about 40 gallons a minute, rising to within 8 feet of the surface.

		Thickness.	Depth.
		Ft.	Ft.
Depth of well (the rest bored) -		—	15
[Reading Beds]	Sand - -	11	26
	Blue clay -	4	30
	Sand - -	11	41
	Blue clay -	2	43
	Sand - -	1	44
	Mixed clay -	4	48
	Small flints -	¼	48
Chalk - - - - - -		71¾	120

6. The Thoroughfare. Mr. Carter's, 1895.

Made and communicated by Mr. F. Bennett.

Good supply. Water stands about 26 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Well (? old), the rest bored		—	28
[? Crag or Eocene] Running sand		12	40
[Reading Beds, 26 feet]	Mottled clay	10	50
	Green sand	9	59
	Running sand	2½	61½
	Dark green sand and flints	1	62½
	Mottled clay	2	64½
	Dark green clay	1½	66
[Upper Chalk]	Chalk, with flints nearly every foot	64	130
	Mottled clay [? a marl-bed in the Chalk, or pipe of Reading Beds?]	½	130½

7. The Thoroughfare. Mr. Gall's, 1876.

Sunk and communicated by Messrs. Bennett, of Ipswich.

Water rose to within 25 feet of the surface. Level not affected by pumping 200 gallons an hour.

		Thickness.	Depth.
		Ft.	Ft.
Depth of old well (the rest bored)		—	30
[Reading Beds]	Sand	14	44
	Clay	2	46
	Loamy sand	13	59
	Clay	3	62
	Flints	1	63
Chalk		79	142

8. Waterworks Company. Trial-boring, Brook Street, about 150 yards N. of the Gasworks, 1901.

18 feet above Ordnance Datum. Rest-level of water 18 feet down.

Made and communicated by Messrs. Isler & Co. (Remarks in these brackets from notes on specimens, by Mr. H. B. Woodward.)

Lined with 100 feet of 6-inch tubes. 4 feet below the surface; with 140 feet of 5-inch tubes, 2 feet below the surface; and with 205 feet of 4-inch tubes, 6 feet below the surface.

Yield tested, January 6th to 14th, 1902, and found to be from 975 to 1,050 gallons an hour. Before pumping, the water stood 18 feet down; during pumping, 28½ feet.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Soil		2	0	2	0
[Drift.]	Sand	4	6	6	6
	Gravel and flints	3	0	9	6
	Loamy sand (sandy loam)	4	0	13	6
	Sand	2	6	16	0
	Gravel	3	5	19	5
	Sand and shingle (loamy gravel)	4	0	23	5
	Mottled sand (somewhat loamy)	6	0	29	5
	Sand and shingle (fine gravelly sand)	8	0	37	5
	Grey sand (dark brown silty sand)	1	0	38	5
	Fine sand (shelly sand)	7	0	45	5
[Crag, 95⅓ feet.]	Fine sand, shingle, and Crag (gravelly sand)	60	7	106	0
	Black mud (fine gravelly loam)	1	6	107	6
	Crag with shells (shelly sand, *Turritella*)	25	3	132	9
[London Clay, nearly 20 feet.]	Claystone (septaria)	0	9	133	6
	Blue clay (stiff grey clay)	15	4	148	10
	Sand and pebbles [Basement-bed]	3	9	152	7
[Reading Beds, nearly 41 feet.]	Dark sand (grey firm sand, slightly loamy)	6	5	159	0
	Yellow sand and clay (brown sand)	15	9	174	9
	Blue clay (grey)	2	3	177	0
	Fine yellow sand (brown)	16	6	193	6
Chalk (and flints)		55	6	249	0

An account, from Mr. C. E. Hawkins, has some very slight differences, the chief one being in making the gravel and flints (near the top) 4 instead of 3 feet, and so increasing the depth to the Chalk.

After testing the supply for a week samples were taken; but the water was found to be unsatisfactory for a town-supply (for Analyses, see pp. 161 162). Another trial was therefore made on the higher ground where the Company had some land), of which an account follows. Here good water was got.

9. Waterworks. Trial-boring, Bredfield Road. 1902.

Made and communicated by Messrs. Isler & Co.

Well 10 feet; the rest bored. Lined with 165 feet of tube, 10 inches in diameter, from 4 feet down; 80 feet, of 11½ inches diameter, 20 feet down; and 10 feet, of 15½ inches diameter, 10 feet down.

126 feet above Ordnance Datum.

Rest-level of water 108 feet down. Yield about 11,000 gallons per hour.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Soil or made ground		3	0	3	0
[Drift and Crag.]	Sand and shingle	48	0	51	0
	Red sand and shingle	16	0	67	0
	Red Crag	13	0	80	0
	Light-coloured Crag	4	0	84	0
[London Clay 36 feet]	Blue claystone	1	2	85	2
	Blue clay (? sandy in part)	34	10	120	0
[Reading Beds. 35 feet.]	Mottled clay (specimen grey and red)	? 16	6	136	6
	Sandy clay	12	0	148	6
	Green sand	3	0	151	6
	Green-coated flints	3	6	155	0
Chalk and flints		119	0	274	0

Notes on Well-sections in the Rev. W. B. Clarke's Paper. *Trans. Geol. Soc.*, ser. 2, vol. v., pp. 382, 383 (1840).

The section, given as that of a well at the Post Office, must be wrong, making the depth to the Chalk 510 feet! Nor can the site be identified: it is not at the present Post Office.

The "Barrack Ground" of another section is also non-existent, and a third, "at the entrance of the town," has too vague a site assigned.

It will be seen that of the eight Woodbridge sections which reach to the Chalk seven agree (within small limits) in the depth to that formation, allowing for differences of level in the ground: they vary only, as far as one can tell, from 19 to 47 feet below Ordnance Datum. The sections at Melton (in three places) also agree in this (see pp. 91, 92).

It is clear, then, that we have here as much regularity as can be expected. Judging by the then existing six borings in Woodbridge and the three in Melton, the Waterworks Company was therefore justified in looking forward to a result in accordance with what had gone before, in making its first trial-boring in the town, on low ground, and at no great distance from some of the existing borings.

But the section given by this boring (No. 8) shows a very different state of things, with a depth to Eocene beds of 133¾ feet, a thickness of Crag much greater than any before known in the neighbourhood (about double, indeed) and a depth to the Chalk of 193½ feet, the top of that formation being as much as 175½ feet below Ordnance Datum, an excess of 128½ feet over any other record.

The question arises, How has this unexpected thickness of Drift and Crag (the precise division between which is here of small moment) been preserved? Four explanations suggest themselves.

Firstly, a deep hollow or channel. This would serve, were it a case of Drift only; but we have to deal also with Crag, and it is hard to conceive of this formation filling so deep a hollow, worn out in lower beds. Moreover, we have also Eocene beds, and with them such an explanation is out of the question: they must have been let down in some way. I know of no case in which they fill deep valleys, cut out in the Chalk.

This last consideration suggests the explanation of a huge pipe in the Chalk, into which the overlying beds have been let down, through the dissolving away of the Chalk. But such a pipe would so far exceed anything that is known, and is so unlikely to occur where the Chalk has a fair capping of Tertiary clays, that one hesitates to accept it. However, it might account

for the great thickness of Crag, as compared with what is seen along the outcrop in the neighbourhood.

A third explanation would involve disturbance of the beds, presumably by a fault; but against this is the fact that there is no sign of anything of the sort in the surroundings, though we do not know what there may be in the river-channel.

Another view is that we may here have the result of a landslip, which took place before the bordering hills had been eroded back as far as now. This too, would explain the thickness of the Crag, &c.; but a landslip would not reach to a goodly depth below sea-level, as does the occurrence with which we are dealing.

Of these four explanations that of a fault seems to fit most with the facts but I am not satisfied with any. Of course it is open to us to make a combination of two or more of them.

Mr. H. B. Woodward has suggested that we may have here a trough-fault and probably this is the best explanation.

The above remarks are taken, with some small changes, from a paper read to the Geological Society in 1902, the text for the chief part of which was given by the various borings at Melton and Woodbridge.

Woolverstone.

(Ordn. Map 207, N.S.; Geol. Map 48 N.E.)

1. Rev. W. B. Clarke, *Trans. Geol. Soc.*, ser. 2, vol. v., p. 381 (1840).

Soil - - -	1	To London Clay 31 feet.
Clay, with water	30	

2. For Mr. C. H. Berners. Since 1895.

Made and communicated by Messrs. Le Grand and Sutcliff.

95 feet above Ordnance Datum. Water-level 93 feet down.

		Thickness.	Depth.
		Ft.	Ft.
Soil - -		2	2
[Drift.]	Sand - - - - - -	4	6
	Sandy gravel - - - - -	6	12
[London Clay, 59 feet.]	Brown clay - - - - -	6	18
	Sandy blue clay, with 9 inches of claystone at the base - - - -	13¾	31¾
	Blue clay - - - - -	7¼	39
	Sandy blue clay, with 15 inches of claystone at the base - - -	9¾	48¾
	Sandy clay - - - - -	22¼	71
[Reading Beds, 34½ feet.]	Hard dark sand - - - -	4	75
	Yellow sandy clay, with 21 inches of of hard claystone at the base -	7¼	82¼
	Blowing sand - - - - -	11¾	94
	Hard blue clay - - - -	6	100
	Coloured [mottled] clay - - -	4½	104½
	Green flints - - - - -	1	105½
[Upper Chalk.]	Soft chalk - - - - -	10½	116
	Chalk and flints - - - -	134	250

Wortham.

(Ordn. Map 175, N.S.; Geol. Map 50 N.W.)

1. On the Ling. Sunk and communicated by Mr. BANHAM.
Sand, 14 feet. Water rose 3 feet.

2. THE RECTORY.
Sunk and communicated by Mr. LIMMER.
Water rose 5 feet.

[Boulder] Clay	44	94 feet.
Gravel	20	
Chalk	30	

This section was wrongly entered under Norfolk in the Memoir on "The Geology of the country around Diss." etc. (1884.)

Wratting, *see* Great Wratting.

Wrentham.

(Ordn. Map 176, N.S.; 6 in. Map 19; Geol. Map 49 N.)
Two wells, made and communicated by Mr. J. DADE.
Between cottages, about 1½ miles N.W. of the church. Mr. Rockham's. 1880.
[Boulder clay ? or chiefly so] to water about 60 feet.
House just N.E. of National School, on the high road, at the edge of the village.

Sand	7	12 feet.
Brickearth (Chillesford Clay)	5	

Wyverstone (THE RECTORY).

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Made and communicated by Mr. WARREN.

Brickearth	20	60 feet.
Sand and gravel	40	

Yaxley.

(Ordn. Map 190, N.S.; Geol. Map 50 N.W.)
Sunk and communicated by Mr. DAY, 1–4. By Mr. LIMMER, 5, 6.

1. BY THE CHURCH. Water rose 10 feet.

[Boulder] Clay	30	44 feet.
Gravel	14	

2. IN THE VILLAGE. Water rose 6 feet.

[Boulder] Clay	26	51 feet.
Gravel	3	
[Boulder] Clay	18	
White sand	4	

3. IN THE VILLAGE. Water rose 4 feet.

[Boulder] Clay	46	52 feet.
Sand	6	

4. BY THE BULL INN.
[Boulder] Clay, to Sand 35 feet.

5. THE RECTORY. Water rose 4 feet.
Sand and loam, 40 feet.

6. THE RED LION INN.
Loam and sand, 40 feet.

4. VARIOUS TRIAL BORINGS.

Many borings have been made for other objects than water. Accounts of most of these have already been printed, in Sheet Memoirs, but it has been thought well to reproduce them, with such additions as have come to hand since their publication.

The new entries refer only to two places:—Henley (3) and Stutton; but the section at the latter place is of exceptional interest and no detailed account has yet appeared.

This, by far the deepest boring in the county, after passing through some amount of Drift and Eocene beds, has pierced the whole of the Chalk and of the Gault, finally ending in a rock that seems to be not of less age than Silurian.

It was made to test whether Coal Measures might be found in these parts, and though it has failed to get any directly economic result, yet, taken with the Culford boring (*see* p. 41) and with the still later exploratory one at Weeley, in northern Essex, it has shown that in all probability the Gault is next underlain by rocks older than Carboniferous over part of southern Suffolk and of northern Essex.

Capel.

(Ordn. Map 207, N. Ser.; Geol. Map 48, N.W.)

Trial-boring, in a field near to and N.W. of the Railway Station. 1876.
Made and communicated by Messrs. Bennett, of Ipswich.

Subsoil		$1\frac{1}{2}$	$30\frac{1}{2}$ feet.
[Glacial Drift]	[Boulder] clay	22	
	Loam	5	
	White sand	2	

Corton.

(Ordn. Map 162, N. Ser.; Geol. Map 67, S.)

Three borings, made by the Geological Survey.

1. About half-a-mile N. of the Gap, and opposite a depression in the cliff commencing immediately above the rootlet-bed. Oct. 1886.

Forest Bed Series	Peat	$\frac{1}{4}$	8 feet.
	Unctuous bluish-grey clay	$3\frac{3}{4}$	
	Hard whitish marl or clay, with a few small stones	$\frac{1}{2}$	
	Ferruginous gravel, with quartz and quartzite	$3\frac{1}{2}$	

2. Eleven chains N. of the Gap. Three feet above high-water springs. Oct. 1886.

Lower Boulder Clay. Brown loam, blue at the base; 6 feet.

Forest Bed Series.	Ochreous sandy loam with carbonaceous matter;	$\frac{1}{2}$ foot.
	Gravel;	2 feet.

3. Twenty yards N. of the Gap, and about 3 feet above high-water springs. Oct. 1886.

Lower Boulder Clay.	Brown loam, with fragments of shells	4½	11½ feet.
	Blue clay, with white specks (decayed flint ?)	1	
	Brown sandy loam	1½	
Forest Bed Series.	Gravelly quartzose sand and gravel, with water	4½	

Henley.

(Ordn. Map 207, N. Ser.; Geol. Map 50, S.W.)

Three trial-borings at Walnut Tree Farm, about 450 yards from the main road.

Made and communicated by Mr. F. Bennett, of Ipswich.

For the purpose of finding clay fit for brickmaking. The clay makes a good white brick, but contains so much marl, or very small pieces of chalk that it must be washed or ground.

		Thickness.	Depth.
	No. 1.	Ft.	Ft.
	Soil	2	2
[?Glacial Drift]	White earth and marl	15	17
	Blue earth and marl	25	42
	Yellow earth and marl	4	46
	Loam	½	46½
	Light-coloured earth	2½	49
	No. 2.		
	Soil	1	1
[?Glacial Drift]	Red earth	2½	3½
	Light-coloured earth	5	8½
	Darker earth	2	10½
	Light-coloured earth	6	16½
	Loam	1½	18
	Light-coloured earth	10½	28½
	Sand	6½	35
	No. 3.		
	Soil	1	1
[? All Glacial Drift]	Light-coloured earth and marl	4	5
	Darker earth and marl	17	22
	Blue earth and marl	43½	65½
	Loam	2½	68
	Sharp sand	8	76

Hopton.

(Ordn. Map 162, N. Ser.; Geol. Map 67, S.)

Two borings, made by the Geological Survey.

1. At the loot of the cliff opposite League Hole. Oct. 1886.

Glacial Drift	Boulder Clay;	7 feet.
	Sand;	5 feet.

2. Nearly half a mile S. of League Hole, opposite the highest part of the cliff. Oct. 1886.

Forest Bed Series	Dark-blue unctuous clay;	6 feet.
	Lighter-coloured clay with race;	1 foot.
	Sand.	

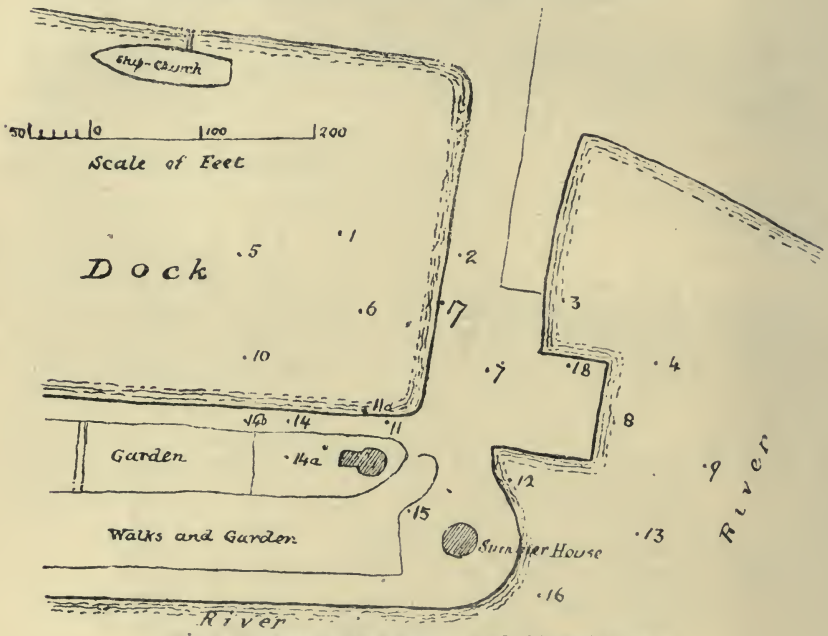
Ipswich.

(Ordn. Map 207, N. Ser.; Geol. Map 48, N.W.)

Dock Commission. Borings made at the Site of intended Entrance Lock to the Dock (at its S.W. corner). 1878.

Communicated by Mr. T. Miller, C.E.

These borings, all within a small area, serve to show the varying character of the beds below the river, and the varying depth to the Chalk. The accompanying plan shows the position of each boring, which could not be very well expressed in words; but it should be remembered that it also shows a former state of things, the new entrance having since been made.



Plan of Borings at the Southern End of Ipswich Dock

1. About $1\frac{1}{2}$ feet below Ordnance Datum.

Ooze and gravel	$4\frac{1}{2}$	To Chalk $22\frac{1}{2}$ feet.
Sand and gravel	10	
Sharp sand - -	6	
Chalk and sand -	2	

2. About $13\frac{3}{4}$ feet above Ordnance Datum.

	Thickness.	Depth.
	Ft.	Ft.
Made ground and mixed gravel - -	$13\frac{1}{4}$	$13\frac{1}{4}$
Peat - - - - - - - -	$1\frac{1}{2}$	$14\frac{3}{4}$
Fine gravel, with dark sand at bottom -	6	$20\frac{3}{4}$
Dark brown clay - - - - -	3	$23\frac{3}{4}$
Dark brown loam - - - - -	$5\frac{1}{2}$	$29\frac{1}{4}$
Dark sand - - - - - - -	$2\frac{1}{2}$	$31\frac{3}{4}$
Sand and gravel, chalky at bottom, to Chalk - - - - - -	$8\frac{1}{2}$	$40\frac{1}{4}$

3. About $4\frac{1}{2}$ feet above Ordnance Datum.	Thickness.	Depth.
	Ft.	Ft.
Made ground and mixed gravel	$10\frac{1}{3}$	$10\frac{1}{3}$
Ooze and gravel - - -	2	$12\frac{1}{3}$
Coarse gravel - - - -	4	$16\frac{1}{3}$
Gravel and ooze - - -	3	$19\frac{1}{3}$
Fine gravel - - - -	3	$22\frac{1}{3}$
Sand to Chalk - - -	$2\frac{1}{2}$	nearly 25

4. About 3 feet below Ordnance Datum.
   River mud, with gravel mixed in lower half 8
   Gravel - - - - - - - - 2 } To Chalk 10 feet.

5. Over 7 feet below Ordnance Datum.
   Ooze and gravel 2
   Sand and gravel 7 } To Chalk 9 feet.

6. Over 2 feet below Ordnance Datum.
   Ooze - - - 3
   Peat - - - 1 } To Chalk 21 feet.
   Gravel and sand 17

7. $13\frac{1}{2}$ feet above Ordnance Datum.
   Made ground - - - 9
   Ooze and fine gravel - - $7\frac{2}{3}$ } To Chalk nearly 29 feet.
   Gravel, with sand at lower part $12\frac{1}{4}$

8. Nearly $1\frac{1}{4}$ feet above Ordnance Datum.
   Mixed ooze and gravel - - - $5\frac{3}{4}$
   Sand and gravel - nearly $8\frac{1}{2}$ } To Chalk about $14\frac{1}{4}$ feet.

9. Over 3 feet below Ordnance Datum.
   River sand - 6
   Coarse gravel $3\frac{1}{2}$ } To Chalk $9\frac{1}{2}$ feet.

10. Over 3 feet below Ordnance Datum.
    Ooze and gravel 3
    Sand and gravel 8 } To Chalk 11 feet.

11. 8 feet above Ordnance Datum.
    Abandoned after $23\frac{1}{2}$ feet, in sand and gravel, in which boulders of sandstone were found.

11A. $6\frac{3}{4}$ feet above Ordnance Datum.
    Ooze - - - - - - - 9
    Gravel, top 17 feet coarse, the rest fine - 42
    Sand - - - - - - - - $1\frac{1}{4}$ } 55 feet.
    Sand and chalk, to Chalk - - - $2\frac{3}{4}$

12. About $9\frac{3}{4}$ feet above Ordnance Datum.
    Ooze, sand, and gravel - - - - $11\frac{1}{2}$ } To Chalk $20\frac{1}{2}$ feet.
    Fine sand, with shingle in the upper part 9

13. $3\frac{1}{2}$ feet below Ordnance Datum.
    Mud and gravel - - - - - 2
    Peat, the lower half with gravel - - 2
    Gravel (upper half coarse) and sand - - 4 } 17 feet.
    Fine loamy sand, bottom foot sharp sand 7
    Chalk and sand, to Chalk - - - 2

14 and 14A. ($13\frac{3}{4}$ and over 14 feet above Ordnance Datum) did not reach Chalk, but after going through ooze and gravel, were stopped by boulders at 22 and 43 feet respectively.

14B. $13\frac{3}{4}$ feet above Ordnance Datum.

Soil	9	27 feet.
Ooze and gravel	$5\frac{1}{2}$	
Dark loam	$3\frac{1}{2}$	
Gravel, upper half coarse, lower fine	4	
Sand, to Chalk and brown flints	5	

15. About $14\frac{1}{4}$ feet above Ordnance Datum.	Thickness.	Depth.
	Ft.	Ft.
Soil about	$9\frac{3}{4}$	$9\frac{3}{4}$
Ooze and gravel	7	$16\frac{3}{4}$
Gravel, coarse and fine	48	$64\frac{3}{4}$
Coarse sand	6	$70\frac{3}{4}$
Pipe-clay, the lower half with coarse sand	2	$72\frac{3}{4}$
Chalk and black clay, to Chalk	3	$75\frac{3}{4}$

16. $3\frac{1}{2}$ feet above Ordnance Datum

Beach	1	30 feet.
Peat	1	
Gravel [? chiefly mixed with clay]	4	
Sand, loamy, then fine, then coarse	12	
Gravel, with sand at top part, loamy at bottom part, to Chalk	12	

17. 12 feet above Ordnance Datum

Made ground, mixed, chiefly gravel	13	39 feet.
Clean gravel	18	
Soft chalk	8	

18. $7\frac{1}{2}$ feet above Ordnance Datum

Made ground, mixed, chiefly gravel, about	13	42 feet.
Gravel ,,	11	
Stiff chalk	18	

Borings along the line of the Intercepting Sewer, from the Gasworks to the end of the London Hardway (along the left side of the Orwell).

Communicated by Mr. P. Bruff, C.E.

20. S.E. of Gasworks, and N. of Myrtle Street: and 19, S. of Myrtle Street.

Made ground (gravelly)	11 feet.
Gravel	$3\frac{1}{2}$ and $2\frac{1}{2}$,,

18. Junction of Clifton Road and Mile End Road.

Made ground (gravelly)	4	13 feet.
Mud [Alluvium]	$3\frac{1}{2}$	
Gravel	5	
Clay	$\frac{1}{2}$	

17. Fork of roads North of the Cliff Brewery.

	Ft.	Ins.	
Soil and made ground	4	8	10 ft. 2in.
Sand (18 inches) and gravel	5	2	
Black clay (? alluvial)	0	4	

16. Road just North of the Cliff Brewery.

	Ft.	ins.	
Road material - - - - -	4	0	14 ft. 7 in.
Sand, with a foot of gravel at bottom -	4	0	
Fine sand - - - - - - -	6	2	
Clay (chalky) - - - - - - -	0	5	

[These last two may be Reading Beds.]

15. Close to the central part of the Cliff Brewery.

	Ft.	ins.	
Road material - - - - - -	2	9	10 ft. 5 in.
Gravel, dry sand, wet sand, and gravel	7	3	
Clay - - - - - - - - - -	0	5	

14. South of the Cliff Brewery and Shipyard, at edge of shore.

	Ft.	ins.	
Road material - - - - - - - -	3	8	9 ft. 8 in.
Black mud, with stones [alluvial] - - -	1	7	
Sand (6 inches) and hard clay [Reading Beds] -	4	5	

13. Below high-water mark, 5 chains southward of 14.

	Ft.	ins.	
Soft clay [? alluvial] -	8	4	8 ft. 9 in.
Chalk - - - -	0	5	

12. Below high-water mark, about 4 chains S.S.W. of 13 (opposite gap).
Sand and then gravel - 6 ft. 8 in.

11. Below high-water mark, 5 chains S.W. of 12.

	Ft.	ins.	
Coarse gravel, sand, and fine gravel -	7	2	8 ft. 8 in.
Blue clay [Reading Beds] - - -	1	6	

10. Below high-water mark, 11 chains from 11, by Hog Island.

Mud (18 inches) and soft clay [Alluvium] -	$5\frac{1}{2}$	13 feet.
Chalk - - - - - - - - -	$7\frac{1}{2}$	

9. Below high-water mark, 7 chains from 10, by Hog Island.

Mud - - - - - -	2	8 feet.
Sand - - - - -	$2\frac{3}{4}$	
Hard clay [Reading Beds] -	$3\frac{1}{4}$	

8. Below high-water mark, about 5 chains from 9, by S. end of Hog Island.

[Alluvium] Soft clay, sand (8 inches) and clay- -	5	7	7 ft. 8in.
[? River Drift] Sand with gravel at bottom (6 inches)	2	1	

7. Below high-water mark, about $6\frac{1}{2}$ chains from 8.

Sand - - - -	7	0	9 ft. 5 in.
Brown [? London] clay -	2	5	

6. Below high-water mark, 6 chains from 7.

Sand -	6	10	8ft. 8 in.
Gravel -	1	10	

5. Below high-water mark, about 6 chains from 6.

	Ft.	ins.	
Mud [alluvial] - - - - - - - - -	1	0	10 ft. 8in.
Loam and gravel - - - - - - - -	5	2	
Loamy clay and hard clay (18 inches) [? London Clay]	4	6	

4. Below high-water mark, 5 chains from 5 [? included in the Sewerage Outfall Works].

Loam with a little gravel	5	11 feet.
Soft clay	1½	
Gravel	1	
[London Clay] Soft clay, wet clay (6 inches), and hard clay	3½	

3. On the London Hardway, below high-water mark [? included in the Sewerage Outfall Works], about 6 chains from 4.

Gravel [pathway of the "hard"]	1½	8 feet.
Mud [alluvial]	4	
Hard brown [? London] clay	2½	

2. On the London Hardway, about 5 chains above low-water mark.

		Ft.	ins.	
Gravel [pathway of the "hard"]		2	8	14 ft. 5 in.
[Alluvium]	Mud	9	0	
	Dark soft peat	2	3	
Dark gravel		0	6	

1. On the London Hardway, less than 3 chains above low-water mark.

	Ft.	ins.	
Gravel [pathway of the hard"]	3	0	10 ft. 10 in.
Mud [alluvial]	6	0	
Gravel, top foot fine, light-coloured and with shells, the rest dark	1	10	

Viaduct of the Felixstow Railway, Spring Road. Four trial borings. for N. and S. piers and abutments. 1876 ?
Communicated by Mr. H. Jones, C.E.
Level of road at viaduct about 46 feet.

Soil	about 2 feet	
London Clay	,, 20 to 22	feet
Hard sand and gravel	,, 12 or 13	,,

Kessingland.

(Ordn. Map 176, N. Ser. ; Geol. Maps 49, N. and 67, S.)
Seven Borings made by the Geological Survey.

1. Beach End. About 4 chains N. of the road. Commenced 6½ feet below the level of the top of the rootlet-bed. 1886.

Blown sand		4	11 feet.
Chillesford Series ?	Blue clay and sand, rather ferruginous	1½	
	White buff, and orange-coloured sand, becoming very pale at 6 feet	1½	
	Orange-coloured loamy sand, with a few stones in the upper part	4	

2. A chain S. of the parish-boundary. 1886.
Forest Bed ? Carbonaceous clay with scattered stones ; a foot.
Blue sand with water ; 4 feet.
3. About 32½ chains S. of Pakefield Lighthouse Gap, and 7 chains S. of the last No. 1. 1888.
Bottom of cliff in greenish-grey clay (Rootlet-bed) stratified with sand in the lower part.

Forest Bed Series	Irregularly stratified very carbonaceous gravelly brown and grey sand ; 8 feet.
	Grey sand with fragments of shells ; 2 feet.
	Gravel, etc. ; 1 foot.

4. Opposite Cliff Farm, a foot below high-water and 5½ feet below the top of the rootlet-bed. 1886.

Forest Bed Series	Unstratified blue clay	7	10 feet.
	Gravelly clay	¼	
	Carbonaceous clay, with vegetable impressions (? roots)	¼	
Chillesford Clay ?	Blue sandy silt, grains very small, carbonaceous grains, but no other fossils	2½	

5. S.E. of Cliff Farm and 2 chains S. of the last. Commenced a foot below the top of the rootlet-bed and about the level of high water. 1886.

Forest Bed Series	Blue clay with rootlets	4½	12 feet.
	Brown sand	2	
	Brown sand, with clay seams and a few stones	½	
	Blue-black clay, with carbonaceous matter and a bad smell	½	
	Sand	¼	
	Stiff marsh-clay	¾	
	Sandy gravel and angular gravel	2	
Chillesford Series ?	Sand	1½	

6. Seven chains N. of the old Coast Guard Station. At the level of high-water springs. 1886.

Forest Bed Series	Light greenish-grey clay	1	9 feet.
	Buff sand	1	
	Clay as above, a few small stones (and roots ?)	1½	
	Buff sand	1½	
	Clay as above	1	
	Buff sand	1⅔	
	White clay	⅙	
	Sand	⅙	
	Brown loam and loamy sand	⅓	
	Gravelly sand	⅔	

7. Three chains N. of the Watch House. Commenced a foot below the level of the base of the rootlet-bed. 1886.

	Blown sand banked against the cliff	2	14½ feet
Chillesford Series ?	Buff and orange-coloured sand, the lower part full of water	12½	

Orwell River.

(Ordn. Map 207, N. Ser.; Geol. Map 48, N.E.)

Three borings at Butterman's Bay, about 2 miles below Pin Mill. Communicated by Mr. T. Miller, Engineer to the Ipswich Dock Commission.

At the bottom of the river, 22 feet below low water.

Gravel, not bottomed, 8 feet.

Pakefield.

(Ordn. Map 176, N. Ser.; Geol. Map 67 S.)

Six Borings, made by the Geological Survey.

1. Eight chains N. of the Lighthouse Gap. Oct. 1886.

Chillesford Clay.	Laminated micaceous light-blue or ferruginous clay and sand	13½	18 feet.
Norwich Crag	Brown loamy sand, with thin seams of light-blue clay	3	
	Sand, with water	1½	

2. About 9¾ chains S. of the Lighthouse Gap, and nearly ½ chain S. of the northern end of the second basin-shaped hollow. Nov. 1888.

[Forest Bed Series.] Black, brown, and grey laminated clay, etc.; 6 feet.

Chillesford Clay. Thinly-bedded micaceous grey clay and fine brown sand, with ferruginous sand in the lower part; 16 feet.

3. About 12¼ chains S. of the Lighthouse Gap, and 2½ S. of the above. Nov. 1888. Bottom of cliff of black, brown, and grey laminated clays, etc; in basin-shaped hollow [Forest Bed Series].

Beach sand.

Forest Bed Series. Brown sand, with seams of grey clay and ferruginous sand and gravel; 10 feet.

Chillesford Series { Micaceous grey clay and red sand; 4 feet. Brown sand; ½ foot.

4. Close to the last, but slightly different. Oct. 1886.

Forest Bed Series { Peaty loam - - - - 2½ Blue loam and gravel - - 2 } 7½ feet.
Chillesford Clay. Laminated clay and sand 3

5. About 22¾ chains S. of the Lighthouse Gap, and a chain S. of the southern end of the second basin-shaped hollow, at high-water level. Oct. 1886.

Forest Bed Series { Carbonaceous clay. (Rootlet-bed, J. H. Blake). Laminated gravelly sand; 6 feet.

6. About 25½ chains S. of the Lighthouse Gap, and 2¾ chains S. of the last. Nov. 1888. Bottom of cliff in compact homogeneous greenish-grey unstratified clay, with race (Rootlet-bed).

Forest Bed. Bluish-grey and blackish loamy clay, with sand in the lower part; 8 feet.

Crag. Reddish sand with many fragments of marine shells; 2 feet.

Stutton.

(Ordn. Map 224, N. Ser.; Geol. Map 48, N.W.)

For the Eastern Counties Coal-Boring and Development Association. 1894, 5.

Bored and communicated by Vivian's Boring and Exploration Co.

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Soil	- - - - - - - -	1	6	1	6
[River Drift, 14½ feet]	Clay and soil - - - - -	1	6	3	0
	Fine gravel - - - - - -	2	0	5	0
	Bound gravel - - - - -	4	0	9	0
	Coarse gravel - - - - -	3	0	12	0
	Bound gravel - - - - -	4	0	16	0
[London Clay and Reading Beds]	Sand - - - - - - -	1	0	17	0
	Clay - - - - - - -	1	0	18	0
	Sand - - - - - - -	6	0	24	0
	Clay - - - - - - -	2	0	26	0
	Sand - - - - - - -	4	0	30	0
	Clay - - - - - - -	4	0	34	0
	Sand - - - - - - -	8	0	42	0
	Green sand - - - - - -	9	0	51	0
	Stiff blue clay - - - - -	1	0	52	0
	Blue clay - - - - - -	4	0	56	0
	Blue clay with thin beds of sand -	7	0	63	0
	Dark sand [? Thanet] - - -	7	0	70	0

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[Upper Chalk]	Flints and Chalk- - - -	2	0	72	0
	Chalk - - - - - -	149	0	221	0
	Chalk and flint - - - -	37	0	258	0
	Chalk - - - - - -	20	0	278	0
	Chalk and flints - - - -	22	6	300	6
	Chalk - - - - - -	6	0	306	6
	Chalk and flints - - - -	63	6	370	0
	Chalk, with flints at ten levels, from 2 in. to 2½ ft. thick - -	111	6	481	6
	Chalk and flints - - - -	2	0	483	6
	Chalk, with flints at fifteen levels, from 3 ins. to 2 ft. thick - -	81	0	564	6
	Grey chalk - - - - - -	4	9	569	3
	Chalk, with 5 inches of flints at the top - - - - -	3	3	572	6
	Grey chalk, with flints at two levels, 3 and 6 inches thick -	7	6	580	0
	Grey marl. Specimen from 585 feet chalk, partly grey - - -	5	0	585	0
	Grey chalk and flints - - -	2	6	587	6
	Grey chalk, with flints at two levels, 4 and 6 inches thick -	29	6	617	0
	Grey chalk and flints. Specimen from 620 feet, white and soft -	4	6	621	6
[Middle Chalk to 790 feet]	Grey chalk. Specimen from 690 feet white with grey streak -	48	6	670	0
	Chalk. Specimens from 727 and 750 feet compact white chalk. From 780, rather hard whitish chalk. Those from 780 to 790 Mr. JUKES-BROWNE reports as rough gritty chalk, with well-marked green-grey veins and with lumps or nodules of white chalk, agreeing in character with the upper beds of the Melbourn Rock -	115	6	785	6
[Lower Chalk]	Marly chalk. Specimens from 796 feet show a hard pale greenish chalk, with dark grains, which Mr. JUKES-BROWNE classes as the Belemnite Marl (*Belemnitella plena* zone) - - - -	21	0	806	6
	Grey chalk. Specimen from 825 feet is fine amorphous calcareous material (JUKES-BROWNE) -	19	0	825	6
	Grey marly chalk. Specimen from 850 feet much the same as the above. A specimen of hard grey chalk from 867 feet is noticed by Mr. JUKES-BROWNE as on the horizon of the Tottern-hoe Stone; so that the beds below are Chalk Marl - - -	48	0	867	6

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
[Lower Chalk]	Grey sandy marl. Specimen from 876 feet of fine amorphous calcareous material (JUKES-BROWNE)	22	6	890	0
	Grey marly chalk. Specimen from 898 feet like the above - -	9	0	899	0
	Grey chalk. Specimens from 903 and 916 feet of like kind to the above - - - - - -	19	0	918	0
	Grey marl with fossils. Specimen from 938 feet calcareous clay, with glauconite-grains - -	20	0	938	0
	Green sand and pebbles [phosphatic nodules]. Specimens from 940 and 944 feet are described by Mr. JUKES-BROWNE as glauconitic calcareous clay like the "Cambridge Greensand." This is clearly the base of the Chalk -	6	0	944	0
Gault. Specimens: from 946, 950 and 969 feet, grey clay with fine sand, the last with large glauconite-grains (JUKES-BROWNE). At 947 feet dark grey clay with shell. Dark grey clay also at 978 and 994 ft. *A feeder of water cut at 989 feet* - -		50	0	994	0
[Old Rocks ? Silurian or older]	Broken and jointy grey shaly sandstone [grey calcareous sandstone or mudstone, finely bedded, dip about 45°, no cleavage or jointing, forms the top of the old rock] - - - - - -	16	6	1,010	6
	[Many cores of hard, bedded, sometimes cleaved, crushed and contorted rocks, with a high dip (sometimes vertical) brought up, the description of which must be deferred. "A chance fracture of the bottom core has yielded a specimen which may be safely determined as an *Orthoceras*," Prof. WATTS in Annual Report of the Geological Survey for 1896, p. 6] - - - - -	515	0	1,525	6

Sudbury. (For the WATERWORKS.)

(Ordn. Map 206, N. Ser.; Geol. Map 47.)
Communicated by Mr. T. HENNELL, C.E.

1. By the high road, westward of the waterworks.		Thickness.	Depth.
		Ft.	Ft.
Soil - - - - - - -		2	2
[Post Glacial Drift]	Loam - -	6	8
	Sandy loam -	10	18
	Gravel - -	8	26
Chalk - - - - - about		12	38

2. By new road, south-westward of the waterworks.		Thickness.	Depth.
		Ft.	Ft.
Soil - - - - - - -		2	2
[Drift]	Loam and Chalk -	3	5
	Brown sand - -	2	7
	Loam - - -	2	9
	Brown loam - -	15	24
Chalk - - - about		20	44

Walton Battery. Northern End. 1872.

(Ordn. Map 225, N. Ser.; Geol. Map 48, N.E.)

Communicated by Colonel B. BRINE, R.E.

Mud and shingle - - -	5	21 feet.
Clean shingle - - -	5	
Stiff blue clay - - -	$2\frac{1}{2}$	
Shell and sand - - -	8	
Hard matter, like sandstone-	$\frac{1}{2}$	

5. ANALYSES OF WATER.

Some of the following analyses have been published; but these are now supplemented by many unpublished records, for which we have largely to thank Dr. H. F. PARSONS, of the Local Government Board, and Dr. J. C. THRESH, Medical Officer of Health of the County of Essex.

The new analyses refer to the following places:—Brandon, Brantham, Creeting St. Peter, Eye, Felixstow (Waterworks Well and Old Supply), Gorleston, Hinderclay, Hitcham, Hundon, Kessingland (Mutford and Lothingland District Council), Leiston (second), Old Newton, Reydon, Ringsfield, Shotley Gate, Stansfield, Stoke-by-Clare, Stratford St. Mary, Stutton, Sudbourne, Thorndon, Waldringfield, Weston, Whatfield, Woodbridge (for Waterworks Co., part of the first and the second) and Woolverstone.

DR. PARSONS remarks that "some of the waters in Suffolk, from deep wells in the Chalk under Boulder Clay, yield water of an excessive degree of hardness, much above that of ordinary Chalk-water, and are often chalybeate, depositing oxide of iron on exposure to air. (*See* Boulge, Creeting St. Peter, Hundon, Old Newton and Stansfield.) This class of Chalk-water seems peculiar to Suffolk." Very hard water occurs also at Bury St. Edmunds, Felixstow, Lowestoft, Sudbury, Whatfield and Woodbridge, under somewhat different conditions.

Aldeburgh.

G. W. WIGNER. *The Water Supply of Sea-side Watering-places*, 1878, pp. 111, 112. No. 2 also in his smaller version, *Sea-side Water* (words, etc., in brackets from this). In grains per gallon.

1. Waterworks Supply. 2. Town Pump.	1.	2.
Total solid matter	132·2	59·4
Loss on ignition after deducting combined carbonic acid (volatile organic matter)	14·72	8·43
Iron, slight trace in both.		
Chlorine calculated as chloride of sodium	89·27	19·25
Nitrogen as free ammonia	·0017	·0051 (·0067)
,, ,, albuminoid ammonia	·003	·008
,, ,, nitrates	·865	1·76
,, ,, nitrites	·003	traces
Total nitrogen in the four forms	·8727	1·7731
Oxygen absorbed by organic matter	·012	·1
Hardness before boiling (Clark's scale)	24·5°	Oct. 2, 18·6° Oct. 6, 18·7°
,, after ,, ,, ,,	14·8°	Oct. 2, 7·4° Oct. 6, 9·9°

1. "A most undesirable drinking water. It had an offensive smell of leaves, and the microscope showed that it was full of vegetable contamination. . . . The colour was strong blue . . . the water was so salt as to be briny to the taste."

2. "Had a very objectionable yellow green colour, and a most offensive smell . . . microscopic examination showed that the water swarmed with monads, bacteria, and vibrions, and contained animal remains in addition." To this even stronger remarks are added.

Public Supply, from Dr. D. SWEETING'S *Report to Local Government Board on Water Supply of Aldeburgh*, 1899, pp. 9-13.

Firstly, by Sir E. FRANKLAND, 1. October, 1896; 2. January, 1898, from a tap supplying Aldeburgh Cottages. In parts per 100,000.

	1	2
Total solid matters	95·	94·
Organic carbon	·21	·117
Organic nitrogen	·034	·023
Ammonia	·002	—
Nitrogen as nitrates and nitrites	1·456	1·312
Total combined nitrogen	1·492	1·335
Previous sewage or animal contamination	14·21	12·8
Chlorine	26·5	28·9

Hardness—Temporary, 20·3 (22·9); Permanent, 18 (6·8). Total, 38·3 (29·7). The figures in brackets from the later analysis.

Appearance, highly turbid in the first, clear in the second.

Of the first, he says:—

"This water, besides being highly saline, contains a large quantity of organic matter, and exhibits strong evidence of previous pollution by sewage or other animal matter. It is quite unfit for dietetic purposes, and, being very hard, is useless for washing. The bacterioscopic examination is confirmatory. The . . . sample contained 450 microbes per c.c."

Of the second he says:—

"Although this water does not contain an excess of organic matter it is derived from very impure sources, and a small proportion of the organic matter is of animal origin. Indeed about one-eighth of the water has been in the condition of average London sewage. . . . Although the water is clear the filtration had not been bacterially efficient, for the sample contained the enormous number of 20,660 microbes per c.c. (about 20 drops)."

Secondly, from samples taken in June, 1898; three, by C. E. CASSAL; one, by Dr. J. C. THRESH.

1. Sample from reservoir; 2. from garden-tap at Mr. Padd's house; 3. from scullery-tap, Sunnymeade. In parts per 100,000 (top 4 lines).

	1	2	3
Total solid matters	106·4	106·4	108·
Chlorine as chlorides	25·5	27·4	27·
Equal chloride of sodium	42·02	45·15	44·49
Nitrogen as nitrates	1·4	1·4	·4
*Oxygen absorbed from permanganate (at 30°C. in four hours)	·714	·571	·743
*Saline ammonia	·05	·022	·046
*Organic ammonia	·096	·058	·072

Nitrites absent in all. Phosphates marked traces in all.

* These three in parts per million.

Hardness, in all, 26; Permanent, 8·6; Temporary, 17·4.

Appearance in a 2-ft. tube. Fairly clean in 1 and 2, cloudy in 3, slight greenish tint in all.

Odour not abnormal in 2 and 3, not noted in 1.

Reaction neutral in all.

Appearance of solids on ignition, slight browning in all.

Microscopic examination of the suspended matters. In 1 and 2, a little flocculent vegetable matter. A few diatoms. Fragments of Algæ. Mineral matter. In 3, flocculent vegetable matter. Diatoms. Living infusoria and anguillulæ.

"The three samples are closely similar in certain respects, but in others they exhibit differences which are to some extent accounted for by . . . the sampling." The various living matter, etc., in 3, "appears to be accounted for by the fact that this sample was taken from a point where the water is likely to have remained stagnant." 2 seems "to represent the water which was being delivered at the time of sampling to the greater part of the town, and the fact that it is of rather better quality than No. 1, is, no doubt, due to the . . . settlement and slight filtration to which . . . the water is subjected."

1 "represents the untreated supply at the time of sampling."

"The organic matter present is of vegetable origin, but it is higher in amount than is desirable. The water, however, cannot be condemned as unfit for use on these grounds."

"The amount of 'nitrogen as nitrates' is very high: but while this fact, with respect to many waters, would justify grave suspicion, I am not prepared to assert, in view of the evidence before me, that in this case the high nitrates afford serious ground for alarm. I consider, however, that the point is one which calls for searching investigation. . . . No evidence is afforded of the existence of pollution or contamination with matters partaking of the nature of sewage at present. While the results in" 2 "appear to show that an improvement is brought about by the filtration . . . it is probable that more satisfactory results could be obtained by the introduction of a more effective system of purification. In any case the supply is one which should be subjected to periodical analytical examination."

Dr. Thresh's sample was taken from the reservoir over the springs. The physical character was clear and colourless.

Total solids - - -	89·7	Parts per 100,000. Given in grains per gallon.
Nitric nitrogen (no nitrites)	1·1	
Chlorine - - - -	25·5	
Organic ammonia, (no free ammonia) -	·07	Parts per million.
Oxygen absorbed in four hours - -	·56	

Hardness, temporary 9°; total 18°.

Results of bacteriological examination. *Bacillus coli* not found.

"The water supplying Aldeburgh is derived from the Coralline Crag. The exposed Crag, not having a large area, the flow of water through it cannot be large. This permits of the free diffusion of certain of the saline constituents of sea-water, especially of the chloride of sodium (common salt). Hence the chlorides . . . are high. The water rises through the bottom of a shallow tank or reservoir in the Crag. From this tank it passes through a . . . smaller tank, in which are vertical sand screens or filters, into the pumping well, from which it is forced through a charcoal filter (since abandoned) into a tank . . . on a tower near the top of the hill," whence it flows by gravitation to the town. "As the result of my examination of the source of the water itself, I am of opinion that it compares very favourably with the best subsoil waters of the Eastern Counties in organic purity. The composition of the

saline constituents . . . especially the absence of chloride of magnesium, indicates that there is no actual admixture with sea water at the site of the waterworks."

Further particulars, given by Dr. THRESH in his book, *The Examination of Waters*, 1904, pp. 318, 319, seem to refer to this sample, and they are therefore inserted here. The results are given in parts per 100,000.

Ca	12·3	Calcium carbonate	23·3
Mg	·8	,, sulphate	10·2
K	3·1	Magnesium sulphate	4·
CO_3	14·	Sodium chloride	42·2
SO_4	10·5	Potassium nitrate	8·
NO_3	4·9	Silica, etc.	2·
		Total solids	89·7

Dr. SWEETING's conclusions from his inquiry are: "That the old source of the water-supply, which was condemned in 1896 by Sir E. Frankland, was subject to manifold pollutions, and was, moreover, unguarded by any filtration whatever. And that the new supply, whilst professedly 'spring water,' is really nothing more than the water soaking through the superficial soil. Its gathering ground, coterminous with a particular geological formation of high porosity, is a much polluted subsoil, contaminated by filth products from cesspools, cesspit-privies, fold-yards, manured fields, manure heaps, pig-styes, and the like. It is, moreover, not improbable that cesspool impurities of considerable aggregate quantity find entrance to the waterworks from the polluted shingle of the foreshore, owing to holding back of the subsoil water by high tides, aided by extra pumping operations, especially during the visitors' season. It may indeed be suspected that the Aldeburgh inhabitants are, in a manner and on occasion, forced into drinking their own diluted sewage. Undoubtedly, when main drainage is established throughout Aldeburgh, and the cesspools are done away with, there will be less risk of dangerous pollution of the water-supply. But there will then be even greater need than now for an adequate supply, in view of the demand there will be for proper flushing of closets and of sewers. That the present supply is inadequate has been shewn."

Beccles.

From deep wells in Drift [and Crag ?], February, 1874.

1. From bore-pipe, 137 feet deep; 2. from well, 91 feet deep.

Sixth Report of the Commissioners . . . to inquire into the Best Means of Preventing the Pollution of Rivers, p. 104. (1874.) In parts per 100,000.

	1	2
Total solid impurity	45·96	51·52
Organic carbon	·13	·074
Organic nitrogen	·019	·019
Nitrogen as nitrates and nitrites	—	·438
Total combined nitrogen (no ammonia)	·019	·457
Previous sewage or animal contamination	—	4·06
Chlorine	5·2	5·2

1. Hardness, temporary, 18·6; permanent, 12· ; total, 30·6.
2. ,, ,, 23·7 ,, 10·3 ,, 34.

The first turbid and palatable, the second clear and palatable.

Benhall Lodge. (*See* p. 27.)

By Mr. J. Napier. 1886 ?

Total solid matters	42·5	Grains per gallon.
Chlorine	10·47	
Nitrites, slight trace		
Free ammonia	·245	Parts per million.
Albuminoid ammonia	·03	

Boulge Hall.

By Dr. A. Dupré. In "Suffolk Asylum Water Supply. Second Report," by G. Hodson, 1890.

Appearance, turbid. Colour, pale greenish.
Deposit, appreciable trace, chiefly oxide of iron.
Hardness before boiling 48·5°, after boiling 35° (Clark).
Phosphoric acid, very heavy trace.

Total dry residue	86·07	grains per gallon
Loss of residue on ignition	13·16	
Sulphuric acid	17·84	
Chlorine	13·13	
Nitric acid	·09	
Ammonia	·02	parts per million.
Albuminoid ammonia	·0017	

This water "gives indication of pollution," and is "unsuited for drinking or other domestic purposes on account of its great hardness, and also on account of the very appreciable amount of iron held in solution."

Brandon. Baron Boneto's Well.

(? The one described p. 31.)

By W. L. Sutton, 1902, in grains per gallon.
Physical characteristics, bright, clear and palatable.

Free ammonia	·002
Albuminoid ammonia	·0014
Nitrogen in nitrates (no nitrites)	·14
Chlorine in chlorides	·85
Solids in solution, dried at 212°	12·95
Oxygen absorbed in 4 hours at 80°	·014

Hardness before boiling 10·5°, after boiling 3°.

"This is the best water that has been through my hands for some time. I can hardly speak too highly of it for dietetic and all domestic purposes; in fact for the general purposes of a public or private supply. Organically it is of great purity and the amount of mineral salts in solution is unusually low for East Anglian water."

Dr. H. F. Parsons, who communicated this analysis, adds that the well is in Chalk, with a shaft of 115 feet and a bore of 100, and that the ground-level is about 115 feet above Ordnance Datum.

Brantham. Zylonite Co. (*See* p. 31.) December 1901.

Made and communicated by Dr. J. C. Thresh. In parts per 100,000.

	Older Well.	Newer Well.
Calcium carbonate	23·25	23·5
Magnesium carbonate	7·75	6·45
Magnesium sulphate	7·05	7·2
Magnesium chloride	4·75	1·75
Sodium chloride	15·25	22·9
Water of hydration, silica, etc.	4·15	3·
Total	62·2	64·8

Dr. Thresh notes that these waters differ from those of several other wells in containing no calcium-salt except the carbonate.

Bury St. Edmunds. Waterworks.

Deep well, in Chalk, November, 1871. (*See* p. 35.)

Sixth Report of the Commissioners . . . to inquire into the Best Means of Preventing the Pollution of Rivers, p. 99 (1874). In parts per 100,000.

Total solid impurity	39·
Organic carbon	·089
Organic nitrogen	·02
Nitrogen as nitrates and nitrites	·481
Total combined nitrogen (no ammonia)	·501
Previous sewage or animal contamination	4·49
Chlorine	2·15

Clear and palatable. Temperature 5°C.

Hardness, temporary 22·6, permanent 7·4, total 30.

Creeting St. Peter (Well noted on p. 41).

By W. L. Sutton, in grains per gallon.

Communicated by Dr. H. F. Parsons.

Appearance slightly turbid, with deposit on standing.

Odour and colour not abnormal.

Free Ammonia	·032
Albuminoid Ammonia	·0014
No nitrogen in nitrates or nitrites	—
Chlorine in chlorides	7·9
Solids in solution dried at 212° F.	75·25
Oxygen absorbed in four hours at 80° F.	·02
Iron in solution	·05

Hardness before boiling 30°, after boiling 14°.

"This water is free from sewage or surface pollution. On standing it becomes very bright and clear and precipitates a slight ferruginous deposit. Because of this character and the large amount of solid matter in solution it cannot be considered a first class water for general domestic use. Otherwise the amount of iron left undeposited being small, it is unobjectionable for drinking purposes."

Eye, The Brewery. (*See* p. 50.) March, 1899.

Made and communicated by Dr. J. G. Thresh. In parts per 100,000.

Calcium carbonate	32·
Calcium sulphate	8·85
Magnesium sulphate	·55
Magnesium chloride	1·2
Sodium chloride	4·45
Sodium nitrate	·7
Silica, etc.	2·75
Total	50·5

Felixstow. Sample from a main pipe.

G. W. Wigner. *The Water Supply of Sea-side Watering-places.* 1878, pp. 14, 15. In grains per gallon.

"The water is reported to be drawn from natural springs in adjacent hills, but it is not so good as might be expected from such a history."

Total solid matter	59·1
Loss on ignition, after deducting combined carbonic acid	10·88
Iron, heavy traces.	
Chlorine, calculated as chloride of sodium	13·34
Nitrogen as ammonia	·0009
Nitrogen as albuminoid ammonia	·0023
Nitrogen as nitrates	1·926

Nitrogen as nitrites	·005
Total nitrogen in the four forms	1·9342
Oxygen absorbed by organic matter	·0032

Hardness before boiling (Clark's scale) 30°, after boiling 12°.

"The large proportion of nitrates and chlorides evidently indicate animal contamination of some kind on the gathering grounds from which the springs are fed. The microscopical examination showed the presence of much vegetable matter in the residue, but there were no clear indications of animal tissue."

WATERWORKS. (*See* p. 51.)

(1.) Well, carried into the Chalk; (2.) The Old Supply from the Cliffs.

Information from Mr. J. MANSERGH.

	1	2
Free ammonia	·02	·0021
Organic ammonia	·0021	·0014
Nitrogen or [as ?] nitrates	trace	2·38
Chlorine	22·05	6·65

From the amount of chlorine it seems that the well-water shares in the usual saltness of well-waters along the coast of Suffolk and of Essex.

The old supply must come from the Red Crag.

Public Supply. April, 1904.

Made and communicated by Dr. J. G. THRESH. In parts per 100,000.

Ca.	8·5
Mg.	4·2
CO_3	16·6
SO_4	5·6
Cl	28·85
NO_3	·35

which are probably combined as follows:—

Calcium carbonate	21·25	Total 70·4
Magnesium carbonate	5·35	
Magnesium sulphate	7·	
Magnesium chloride	5·1	
Sodium chloride	28·15	
Sodium nitrate	·6	
Silica, water of hydration, etc.	2·95	
Free ammonia	·0014	
Organic ammonia	·0038	
Oxygen absorbed in 4 hours at 27 ° C.	·0248	

Dr. THRESH notes that this water differs from that of several other wells in containing no calcium-salt except the carbonate. There are no nitrates. Hardness, Temporary 23°, Permanent 11°, Total 34°.

Glemsford. For Public Supply. (Deep boring, *see* p. 58.)

By the County Analyst, 1905.

Communicated by Dr. J. S. HOLDEN.

Free ammonia	·016	Grains per gallon.
Total solids in solution	43·05	
Chlorine	3·95	
Oxygen absorbed in 4 hours	·007	

No organic ammonia. No nitrogen as nitrates or nitrites.

Hardness, before boiling, 29·8°, after boiling, 12·1°.

"Of great organic purity. It contains in suspension a fine iron-rust which is probably due to its action on the iron tubes and is only temporary."

Gorleston. Cliff Hotel.

(Ordn. Map 162, N.S.; Geol. Map 67, S.)
By F. Sutton.

Communicated by Messrs. Fake, who say that unfortunately the account of the well has been lost.

"A most exceptional water for this part of the coast, it being of really excellent quality. It is practically free from organic impurities and is mech better adapted to economical laundry-use than the usual underground water of the district."

Hinderclay, Water Supply. (*See* p. 67.)

By Dr. C. W. Low. (in grains per gallon).
Communicated by Dr. H. F. Parsons.

Colourless in 12 inch column. No smell.
Turbidity slight, due chiefly to suspended colour.

Residue left on evaporation pure white, no change on ignition -	25·2
Chlorine - - - - - - - - - - - -	3·5
Nitrites, slight trace. No nitrates or free ammonia - - -	—
Iron, slight trace and trace of zinc - - - - - - -	—
Oxygen absorbed in fifteen minutes at 212°F - - - -	10·

"The water is free from organic impurities and well suited for all domestic purposes. The zinc comes from the galvanized pipes, so that it is advisable to empty pipes by pumping before drawing water for drinking purposes."

Hitcham, Cross Green. Boring for Public Supply? (*See* p. 68.)

By the Clinical Research Association, from a sample taken at the conclusion of the test-pumping. In grains per gallon.
Communicated by Dr. H. F. Parsons.

Total solids, dried at 120°C. - - -	30·38
Combined chlorine (expressed as Na. Cl. 6·1)	3·7
Nitrogen as nitrates (no nitrites) - -	·02
Saline ammonia - - - - - - -	·0143
Albuminoid ammonia - - - -	·0035
Oxygen absorbed in four hours at 27°C. -	·048

Hardness 20·5°.

"This is a water of moderate organic purity and being derived from a deep well not as good as it should be."

Hundon. New Well. (*See* p. 72, No. 4.)

By J. W. Knights, June 1901. In grains per gallon.
Communicated by Dr. H. F. Parsons.

Total solid matter - - - - - - - - - - -	64·
Chlorides (=chloride of sodium 6·59) - - - - - -	4·
Ammonia, free - - - - - - - - - - -	·0476
Ammonia, albuminoid - - - - - - - - - -	·0021
Oxygen absorbed by organic matter in fifteen minutes at 140°F -	·0196

Hardness, 42·1°; temporary, 25·7°; permanent, 16·4°.
Appearance in 2 foot tube slightly turbid.
No smell, when heated to 100°F.
A slight deposit of oxide of iron.

The "total solid matter is rather high and consists chiefly of carbonate and sulphate of lime, with a little magnesia; chlorides are low and nitrates are absent. Free ammonia is high. Albuminoid ammonia and oxygen absorbed are low and show the absence of organic matter. I consider the water is unpolluted and fit for drinking purposes."

Ipswich.

Messrs. Ransome & Rapier, Waterside Works, Stoke. (*See* p. 78.)

Analysis of the water, taken from the bore, after pumping for several hours. By James Napier :—

Total solid matters	99·5	Grains per gallon.
Chlorine	25·9	
Equal to chloride of sodium	42·68	
Nitrogen as nitrates	·75	
Free ammonia	·052	Parts per million.
Albuminoid ammonia	·285	

Appearance, yellow. Hardness, 25°.

Public Water Supply.

1. From deep well in Chalk ; 2. From spring from Red Crag.
November, 1874.

Sixth Report of the Commissioners . . . to inquire into the Best Means of Preventing the Pollution of Rivers, pp. 100, 125. (1874). In parts per 100,000.

	1.	2.
Total solid impurity	48·6	36·48
Organic carbon	·064	·053
Organic nitrogen	·017	·016
Ammonia	·002	—
Nitrogen as nitrates and nitrites	·943	1·277
Total combined nitrogen	·962	1·293
Previous sewage or animal contamination	9·13	12·45
Chlorine	3·9	9·55

Clear and palatable. Temperature, 9° and 5·5° Cent.
1. Hardness, temporary, 23·7 ; permanent, 12·3 ; total, 36.
2. ,, ,, 17·8 ; ,, 10·4 ; ,, 28·2.

Kessingland.

By J. Napier, pp. 8 and 9 of Dr. R. B. Low's Report to the Local Government Board, 1896.

1. From a well in Green Lane, Beach End. 2. From a well at Belvidere Terrace, Beach End. 3. From a well at Belvidere Place, Beach End. 4. From a well at Upper Town.

	1.	2.	3.	4.	
Total solid matters	81·66	4 ?	94·33	192·5	Grains per gallon.
Chlorine	14·25	27·5	12·75	22·85	
Nitrogen as nitrates	2·75	3·25	2·1	3·94	
Free Ammonia	·205	—	·03	·106	Parts per million.
Albuminoid Ammonia	·26	·18	·325	·598	

1. and 3. These waters are contaminated with objectionable impurities, and are unfit for drinking purposes. Appearance of No. 1 turbid.

2. This water is slightly contaminated with objectionable organic impurities. It must be regarded with great suspicion, as it is liable to become heavily impregnated after much rain.

4. This water is heavily contaminated with objectionable organic impurities and is unfit for drinking purposes. Appearance, yellow and with a small quantity of suspended vegetable matter.

For the Mutford and Lothingland Rural District Council.

(*See* p. 82.)

By W. L. Sutton. March, 1900. In grains per gallon
Communicated by Dr. H. F. Parsons.

	From spring in trial hole, Latimer Dam.	From Cutting near trial-hole.
Total solids in solution - -	40·04	31·9
Ammonia, free - - -	—	·007
,, organic - -	trace	·016
Chlorine - - - -	6·5	3·7
Nitrogen as nitrates - -	·37	·29
Oxygen absorbed in four hours	trace	·229
Hardness before boiling - -	23·2°	7·2°
,, after ,, - -	17·1°	

"The water from the trial-hole is of great organic purity and in my opinion perfectly safe for drinking purposes. It shows no trace . . . of pollution by sewage or surface-drainage. The only objection . . . is its great hardness. For a public supply of course this is a serious drawback, although dietetically of minor importance."

"The sample from the cutting has the character of a surface-water. It is free from animal pollution, but contains excess of vegetable organic matter in solution. It is a hard water, but less so than the other."

Leiston. Messrs. R. Garret & Sons' Works. Deep boring

(*See* p. 85.)

By James Napier. In grains per gallon.

Calcium carbonate - - - -	9·06
Magnesium carbonate - - - -	1·05
Calcium sulphate - - - - -	69·75
Magnesium sulphate - - - -	24·04
Magnesium nitrate - - - -	·65
Magnesium chloride - - - -	39·06
Sodium chloride - - - - -	438·6
Alumina, oxide of iron, etc. - - -	1·05
Silica - - - - - - - -	·7
Organic matter and water of combination	8·5
Total solid matters -	592·46

Later analyses of three samples of Leiston water have been made at the Government Laboratory, Clements Inn Passage, London, by Prof. T. E. Thorpe, January, 1900: 1. Works stand-pipe; 2. High Street stand-pipe; 3. Crosses Lane stand-pipe. The results are in parts per 100,000.

Communicated by Dr. H. F. Parsons.

	1	2	3
Total solid matter - - - - - -	60·28	60·85	60·92
Free ammonia - - - - - - -	·003	·002	·002
Albuminoid ammonia - - - - -	·006	·005	·003
Combined chlorine - - - - - -	5·5	5·47	5·54
Nitrogen from nitrates (none from nitrites)	1·583	1·636	1·74
Oxygen consumed in three hours - -	·011	·0079	·0111

Hardness, total, in all 21·3°; permanent 6·8°.

"All the samples were neutral, odourless, clear and bright and practically free from sediment."

"These results show that the water possesses a high degree of organic purity, but has considerable hardness and contains a somewhat large amount of chloride and an abnormal quantity of nitrate."

"It is possible that the conditions under which the water is collected and stored account for the chloride and nitrate present and offer security that the oxidation of organic matter which has produced the nitrate may be relied upon for the future. But if this is not so then the supply cannot be considered a safe one, though in its present condition the water is fit for potable use."

MR. NAPIER'S analysis was of water from the deep boring. Those by PROF. THORPE must be of water from another source.

Lowestoft.

Sample from a pump at a hotel.

G. W. WIGNER. *The Water Supply of Sea-side Watering-places.* 1878. pp. 10, 11. In grains per gallon.

Total solid matter	141·8
Loss on ignition, after deducting combined carbonic acid	28·5
Iron, heavy traces.	
Chlorine, calculated as chloride of sodium	59·67
Nitrogen as ammonia	·0291
Nitrogen as albuminoid ammonia	·0158
Nitrogen as nitrates	5.4604
Nitrogen as nitrites	·0064
Total nitrogen in the four forms	5.5117
Oxygen absorbed by organic matter from a standard solution of permanganate of potash	·12

Hardness before boiling (Clark's scale) 52°. After boiling 42°.

"This water when examined in a 2 foot tube was of a dark urine yellow colour, almost opaque, and had an offensive saline taste. The residue left on evaporation of a portion of it fused on ignition. The microscopical examination showed that it was full of urine salts, with a large number of particles of epithelial matter of different kinds, many crystals of urate of potash being visible. When tested by the addition of sugar the peculiar growth of cells indicating the presence of drainage matter was strongly marked. This water is, therefore, as bad as it is possible for a drinking water to be."

He quotes an analysis, by Dr. TIDY, of the public supply, which is good.

Melton. Suffolk Asylum, 1893. (*See* p. 91.)

Quoted from a Report by Dr. G. TURNER in Dr. J. C. THRESH'S "Water and Water Supplies," Ed. 2, pp. 179, 184; 1896.

1 and 2 from bored well, 350 feet deep, on 11th and 21st of October: 3 from a second bored well, 305 feet deep, 16 feet from the other.

(In grains per gallon)	1.	2.	3.
Total solids	41·9	45·4	45·1
Nitric nitrogen	—	trace	—
Chlorine	12·7	6·4	11·4
(In parts per million)			
Free ammonia	·2	·29	·22
Albuminoid ammonia	·09	·23	·1
Oxygen used in four hours	·43	·33	·35

The difference between the amount of chlorine in 1 and 2 is marked and led to the conclusion "that the lining of the bore was defective, admitting subsoil water." Waters 1 and 3 "are probably free from admixture with subsoil water." It was proved that such water gained access to the first well, "by digging a hole near the base and pouring into it a quantity of solution of chloride of lithium. Two days later lithia could be detected in the water pumped from the bore tube." No. 2 "is an example of an impure disease-producing water, containing less chlorides and absorbing less oxygen than an unpolluted water from the same source."

Melton and Woodbridge. (*See* pp. 91, 127.)

By Dr. A. Dupré. In *Suffolk Asylum Water Supply, Second Report*, by G. Hodson, 1890.

	Coach and Horses Inn. (=Melton Brewery).	Mr. Galls, The Thoroughfare, Woodbridge.
Appearance	Very slightly turbid	Very slightly turbid
Colour	Pale yellowish green	Pale yellowish green
Deposit	trace	trace
Hardness before boiling	28·6°	43°
Hardness after boiling	9·5°	19°
Phosphoric acid	heavy trace	very heavy trace
	Grains per gallon.	
Oxygen absorbed from permanganate	·076	·036
Total dry residue	38·75	53·14
Loss of residue on ignition	3·42	3·8
Sulphuric acid	3·7	7·5
Chlorine	3·8	5·3
Nitric acid	2·75	5·09
	Parts per million.	
Ammonia	—	·005
Albuminoid ammonia	·0062	·0071

They "are both largely polluted by sewage or surface drainage, and the organic matter thus derived is only partially oxidized." Both are "unfit for drinking, or, indeed for any other domestic purpose."

Old Newton.

Well of the Rural District Council of East Stow, near The Shoulder of Mutton. (*See* p. 95).

By W. L. Sutton, 1898. Results in grains per gallon.
Communicated by Dr. H. F. Parsons.

Appearance. Deposit of iron-oxide on standing. Water bright and clear above deposit.

Free ammonia	·0035
Albuminoid ammonia	·0007
Chlorine in chlorides	5·7
Solids in solution dried at 212°F.	49·49
Oxygen absorbed in four hours at 80°F.	·03

Trace of iron only in solution. No nitrates or nitrites
Hardness before boiling 27·2°, after boiling 12·5°

"This water is free from pollution by sewage or surface-matter. When received it had a slight taste only and no smell. It is impossible for me to say whether the deposit of iron . . . was derived from the tubes or whether, the sample being clear when drawn, it had precipitated during the journey. In any case, inasmuch as the sample contained practically no iron in solution, I do not consider the water invalidated for drinking purposes."

Reydon. Additional supply to SOUTHWOLD. (*See* p. 100.)

From a well of 20 or 30 feet deep in Crag [? Pebbly Gravel] some three miles N.W. of the town. June, 1903.

Made and communicated by Dr. J. C. THRESH. In parts per 100,000.

Calcium carbonate	27·3
Calcium sulphate	5·5
Calcium chloride	2·5
Magnesium chloride	1·
Sodium chloride	1·25
Sodium nitrate	4·15
Other constituents	·1
Total	41·8

Ringsfield (S.W. of Beccles).

Brewery Well. 1898.

Made and communicated by Dr. J. C. THRESH.

Chlorine	6·4	Grains per gallon.
Nitric nitrogen	·38	Grains per gallon.
Free ammonia	·08	Parts per million.
Organic ammonia	·06	Parts per million.
Oxygen absorbed	1·24	Parts per million.

Hardness, temporary, 6°; total, 22°.

Shotley Gate.

(*See* p. 104). December, 1900.

Made and communicated by Dr. J. C. THRESH. In parts per 100,000.

Calcium carbonate	25·3
Calcium sulphate	35·4
Calcium chloride	12·2
Magnesium chloride	65·2
Sodium chloride	390·2
Sodium nitrate	·5
Other constituents	1·2
Total	530·

"This boring is only an eighth of a mile north of the River Stour. Obviously tidal water is percolating into the Chalk." But how does it get in? The Chalk does not come up to the bed of the river for miles.

Southwold. Waterworks. Deep Well. (*See* p. 106.)

Made by Prof. ATTFIELD, 1888. *Southwold and its Water Supply* (a Report to the Company), p. 8. In grains per gallon.

	Chalk Water. disregarded	Crag Water. sediment chalk temporary
Total suspended solid matter, dried at 250° F.		
Total dissolved solid matter, dried at 250° F.	467·	54·
Ammoniacal matter, yielding 10 per cent. of nitrogen (equal to ammonia per million 1·28 and ·02) - - - - -	·74	·01
Albuminoid organic matter, yielding 10 per cent. of nitrogen (equal to ammonia per million ·12 and ·07) - - - -	·07	·04
Nitrates, containing 17 per cent. of nitrogen, no nitrites (equal to grains of nitrogen 0 and 1·1) - - - - - - -	—	6·5
Chlorides, containing 60 per cent. of chlorine (equal to grains of chlorine 186 and 8) -	310·	13·3
Oxygen absorbed in three hours - - -	not given	·06

Physical examination. The first turbid, but the filtered water only was examined. The second, when drawn, clear; satisfactory.

The Crag water is "of a very excellent quality."

Probably the water from the Pebbly Gravel above is here included with that from the Crag.

Stansfield.

Well No. 1. (*See* p. 108).

Made by F. W. KNIGHTS, County Analyst for Cambridgeshire. Results in grain per gallon.

(1.) Feb., 1896: Communicated by Dr. F. PARSONS; (2). 1896: Communicated by Mr. G. INGOLD.

	1	2
Total solid matter - - - - - -	57·	82·
Chlorides, as common salt - - -	9·39	9·72
Nitrates - - - - - - - -	—	trace
Free ammonia - - - - - - -	·0028	·0007
Albuminoid ammonia - - - - -	·0049	·0035
Oxygen absorbed by organic matter in fifteen minutes at 140°F. - - -	·0392	·0392

No. 1.

Appearance in 2 foot tube, clear pale yellow.

No smell, when heated to 100°F.

Microscopic examination. No deposit.

Temporary hardness, 3·5°. Permanent, 35°.

"Total solid matter and chlorides are moderate in amount."

"Free and albuminoid ammonia and oxygen absorbed are fairly low and show the absence of any appreciable quantity of organic matter." This applies to No. 2 also.

No. 2.

Microscopic examination. No deposit.

Temporary hardness, 3°; permanent, 40°.

"Total solid matter, which consists chiefly of sulphate of lime and chloride of sodium is rather high."

Stoke-by-Clare. (*See* p. 109).

(Ordn. Map 206, N. Ser.; Geol. Map 47.)

Clare College. 1. From well, May, 1900. 2. From spring from gravel overlying chalk, June, 1900.

Made and communicated by Dr. J. C. Thresh. In parts per 100,000.

	1	2
Calcium carbonate -	28·2	28·5
Calcium sulphate - -	13·1	10·9
Magnesium sulphate -	7·8	6·5
Magnesium chloride -	2·5	1·35
Sodium chloride - -	—	1·65
Sodium nitrate - -	2·7	·95
Silica, etc. - - -	1·	1·5
Water of hydration -	1·7	—
Total -	57·	45·5

Stratford St. Mary. Well 15 feet. deep.

(Ordn. Map 224, N.S.; Geol. Map, 48, N.W.)

Made and communicated by Dr. J. C. Thresh.

Chlorine - - -	9·4	Grains per gallon.
Nitric nitrogen - -	2·3	Grains per gallon.
Free ammonia - -	·04	Parts per million.
Organic ammonia -	·15	Parts per million.
Oxygen absorbed -	1·2	Parts per million.

Hardness, temporary, 11°; total, 24°.

Stutton. Crepping Hall.

By Dr. J. A. Voelcker, May, 1893. Communicated by Mr. Graham.

In grains per gallon.

Total solid residue - - - - - -	46·76
Oxidisable organic matter - - - - -	·15
Chlorine (equal to chloride of sodium, 8·55)	5·19
Nitric acid as nitrates - - - - - -	7·
Free ammonia - - - - - - -	·0005
Albuminoid ammonia - - - - - -	·003

Sudbourn, 1899. Two Samples.

Made and communicated by Mr. S. Harvey, of Canterbury. In grains per gallon.

	A.	B.
Chlorine in chlorides - - -	3·15	1·82
Nitrogen in nitrates - - -	·36	·03
Albuminoid ammonia - - -	·0014	·0012
Oxygen absorbed in fifteen minutes	trace	trace
Oxygen absorbed in four hours -	·024	·016
Total solid matter - - -	24·22	16·66

In both: appearance clear. No smell. Microscopic examination of deposit, slight and unimportant. No phosphoric acid. No ammonia.

"The above results are satisfactory in both cases and indicate water organically pure and free from sewage-percolation."

Sudbury.

Shallow Wells in Chalk. May, 1868.

Sixth Report of the Commissioners . . . to inquire into the Best Means of Preventing the Pollution of Rivers, p. 83. 1874. In parts per 100,000.

—	Total Solid Impurity.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Total combined Nitrogen.	Previous Sewage or Animal Contamination.	Chlorine.	Hardness. Temporary.	Permanent.	Total.
Four Swans well - - -	104·6	·06	·028	·01	4·95	4·986	49·26	9·81	34·	16·7	50·7
Horn Inn well - - -	64·24	·014	·007	·008	2·061	2·075	20·36	5·29	28·1	10·8	38·9
J. Harding's well - - -	70·7	·024	·009	·005	2·263	2·276	22·35	5·53	25·6	15·	40·6
Old Post Office pump -	131·8	·178	·103	·015	2·741	2·856	27·21	11·93	39·7	31·8	71·5
Post Office well - - -	84·04	·358	·25	—	3·686	3·936	36·54	7·2	30·1	15·	45·1
Rose and Crown well -	81·1	·129	·07	·002	5·625	5·967	55·95	7·99	29·6	14·7	44·3

From deep wells in Chalk. The first three May, 1870, the last April, 1872.

Sixth Report of the Commissioners . . . to inquire into the Best Means of Preventing the Pollution of Rivers, p. 100. 1874. In parts per 100,000.

	Total Solid Impurity.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen as Nitrates and Netrites.	Total Combined Nitrogen.	Previous Sewage or Animal Contamination.	Chlorine.	Hardness. Permanent.	Temporary.	Total.	Remarks.
Webb's - -	44·9	·05	·012	–	1·005	1·017	9·73	6·5	28·1	6·5	54·6	Slightly turbid palatable.
Priors - -	44·94	·045	·007	–	·506	·513	4·74	7·4	24·6	7·4	32·	Clear and palatable.
Bore-hole 5 -	43·8	·09	·02	·019	·5	·536	4·84	5·3	30·2	5·3	35·5	Turbid, palatable.
, , -	44·	·042	·018	–	·339	·357	3·07	8·2	29·6	8·2	37·8	

Well 200 feet deep.

Dr. J. C. Thresh, "Water and Water Supplies," 1896, p. 85, or 1901, p., 89.

Total solids - - 37
Chlorine - - 3·4 } Grains per gallon.
Nitric nitrogen - ·3
Organic ammonia ·02 } Parts per million.
Oxygen used - ·07
*Hardness, temporary, 20°; total, 21·7°.

The following by T. Dunlop, 1897 ? (published), may be based on the above.

Total solids - - 34
Carbonate of calcium 21·5 } Grains per gallon.
Chloride of sodium - 5·2

In the original these figures have been accidentally transposed.

Thorndon. THE REFORMATORY. (*See* p. 114). March, 1899.

Made and communicated by Dr. J. C. THRESH. In parts per 100,000.

Calcium carbonate	29·3
Calcium sulphate -	4·8
Magnesium chloride	3·95
Sodium chloride -	1·2
Sodium nitrate -	.3
Silica, etc. - -	1·45
Suspended matter -	2·5
Total	43·5

"The water was opalescent and did not clear on standing. Deposit very fine sand and clay."

"When first pumped the water has an odour suggestive of sulphuretted hydrogen; but this rapidly disappears when the water is exposed to air."

Waldringfield. SCHOOL. Well 60 feet deep.

By W. L. SUTTON, June, 1904. Results in grains per gallon.
Communicated by Dr. H. F. PARSONS.

Physical characteristics, clear, no colour or smell.

Albuminoid Ammonia (no free Ammonia)	·005
Nitrogen in Nitrates (none as nitrites) -	1·34
Chlorine in chlorides - -	1·8

"This is not a water of first-rate quality, but it is free from dangerous pollution in its present condition. . . It is not unfit for drinking purposes."

Weston.

From a well with a shaft of 100 and a bore of 50 feet.
By Mr. F. FARRELL.

Appearance. A large amount of brown insoluble matter (iron oxide) is present, but is readily separated by filtration.

Organic Matter. The water is very free from this, and the absence of nitrites and nitrates indicates that it has not been in contact with putrescible organic matters (sewage, etc.)

Mineral Constituents. Consist almost wholly of calcium sulphate and iron oxide. Only the merest trace of chloride is present.

Iron, as ferric oxide - - - - - -			·12815	per cent.
Lime (calcium oxide)	·163142	Calcium sulphate	·395202	
Sulphuric acid	·23206			

The quantity of lime is very high as compared with the water-supply of the town, an analysis of which is appended.

Calcium oxide -	·0157	per cent.
Iron oxide -	·00092	
Magnesium oxide	·00144	
Total solids	·01806	

Whatfield.

By Dr. J. C. THRESH, 1902. Results in parts per 100,000.

Turbidity: thick. Colour: yellow. No smell. Deposit: oxide of iron.

Chlorine (expressed as chloride of sodium, 13·4) - -	8·1
Nitric nitrogen (expressed as nitric acid ·18) (no nitrites)	·04
Free ammonia - - - - - - - - -	·056
Organic ammonia - - - - - - - -	·004
Oxygen absorbed at 80° F. in four hours - - -	·056

Hardness, temporary 33·4°, permanent 10°.

"The analysis. . . gives no indication of contamination by sewage or manurial matter." The water "is in fact of a high degree of organic purity. On the other hand it contains an excessive amount of mineral matter and especially of chalk . . . It also contains a rather large trace of oxide of iron, which renders it unsightly . . and to a certain extent objectionable for domestic purposes. When boiled, iron is deposited with the chalk and the water can then be used for any purposes."

"As a public supply it would give rise to constant complaints, both on account of the hardness and the presence of iron, though its use would not I think be detrimental to health. The addition of a little lime softens it very considerably and . . . causes the iron to be deposited. The water then is of excellent character."

Woodbridge.

Trial-boring for the Waterworks Co.

About 150 yards N. of Gasworks. (*See* p. 127.)

By [Sir] T. Stevenson, January, 1902. Results in grains per gallon.

Soda (Na_2 O)	8·56
Potash (K_2 O) traces	
Lime (Ca O)	18·63
Magnesia (Mg. O)	1·93
Oxide of iron, slight traces	
Chlorine	7·52
Sulphuric acid (SO_3)	8·57
Nitric acid (N_2 O_5). No nitrous acid	7·96
Silica	·92
Combined carbonic acid	10·32

These constituents may be arranged as follows, in grains per gallon:

Sodium-chloride	12·39
Potassium-chloride, traces.	
Sodium-sulphate	4·08
Calcium-nitrate	12·09
Calcium-sulphate	10·66
Calcium-carbonate	18·05
Magnesium-carbonate	4·05
Oxide of iron, slight trace.	
Silica	·92
Total solid residue	62·24 (given as 62·44).

Ammonia, trace.	
Albuminoid or organic ammonia	·0035
Oxygen required to oxidise the organic matter	·009

Hardness: temporary 21°, permanent 16·5°, total—37·5°.

A saline hard water unsuited for washing purposes; also not good for dietetic purposes.

"The organic purity is high and there are no signs of recent contamination. But the nitrates are excessive: indeed in such quantities that, coupled with the objectionable salinity, force to the conclusion that the water is unfitted for a public supply."

Another analysis, made by W. L. SUTTON, in January, 1902, gave the following results in grains per gallon (except organic carbon and nitrogen).

Total solids in solution - - - -	64·7
Chlorine - - - - - - -	8·
Nitrogen in nitrates, no ammonia - -	·49 (found later to be 1·92)
Oxygen absorbed in four hours - -	·011
Lime - - - - - - - -	18·7
Magnesia - - - - - - -	2·27
Sulphuric anhydrite (figure not given).	
Alkalinity (as carbonate of lime) - -	21·1

Hardness; before boiling, 29·6°; after boiling, 1·28°.

Physical characters. Very slight deposit of chalk, otherwise bright and clear.

"Organically this water could not be better. It holds however a high proportion of mineral salts in solution and is therefore very hard and alkaline . . . resembling in this respect all the chalk-waters of which I have knowledge along the Suffolk coast. It is not so saline as some, *e.g.*, the Felixstowe public supply, in which the chlorine amounts to 16 grains per gallon. I do not consider the present sample unfit for dietetic purposes, but of course for general domestic and manufacturing purposes its great hardness must tell very much against it."

Well only 250 yards from the tidal river. (? same as the above.)

From *The Examination of Waters* . . . 1904, pp. 314-5, by DR. J. C. THRESH. Made in February, 1902. In parts per 100,000.

Ca.	28·75	Calcium carbonate -	29·7
Mg.	1·7	,, sulphate -	23·45
CO_3	17.8	,, chloride -	5·4
SO_4	16·55	Magnesium chloride -	6·7
Cl	11·2	Sodium chloride -	4·55
NO_3	10·5	,, nitrate - -	15·5
		Silica, etc. - -	1·8
		Total solids - -	87·1

A letter from Dr. THRESH says: "Note the high nitrates. Yet the water was of the highest organic purity."

See also under **Melton** (p. 155).

Woolverstone. (*See* p. 130.) October, 1902.

Made and communicated by Dr. J. C. THRESH. In parts per 100,000.

Calcium carbonate - -	22·5
Magnesium carbonate -	5·45
Magnesium sulphate - -	13·
Magnesium chloride - -	·55
Sodium chloride - -	44·9
Nitrates, silica, etc. - -	·6
Total -	87·

Dr. THRESH notes that this water differs from that of several other wells in containing no calcium-salt except the carbonate.

ADDENDA.

Brandon (or Santon Downham?). Lingheath Drove. (*See* p. 31.) September 1903.

By W. L. Sutton. Communicated by Dr. H. F. Parsons.

Physical characteristics; bright, clean, palatable, free from colour or smell.

No free ammonia, albumenoid ammonia, nitrites or poisonous metals.

Nitrogen in nitrates	·196	Grains per gallon.
Chlorine in chlorides	1·	
Solids in solution, dried at 212° F.	14·52	
Oxygen absorbed in 4 hours at 80° F.	·0026	

Hardness before boiling 10·6°, after boiling 3·13°.

"An excellent water in every respect, of great organic and mineral purity. It is exceptionally free from organic matter and exceptionally soft for this district. It is in quality admirably adapted for a public supply; in fact it would rank as one of the best public supplies in the Eastern Counties."

Henstead. Mr. Raven's Farm. (*See* p. 67.) February, 1905.

By Alex. Wilson. Communicated by Mr. R. H. I. Palgrave.

Appearance brown, almost turbid.

Solids in suspension (organic ·665, inorganic 1·365)	2·03	Grains per gallon.
Free ammonia	·0014	
Albumenoid ammonia	·00105	
Solids in solution	32·235	
Oxygen absorbed	·5	

Hardness, 19·5°.

"Practically free from ammonia. Solids in solution rather high . . . The great objection is the organic matter in solution, requiring oxidation."

West Stow. Bury St. Edmunds Sewage Farm. (*See* p. 121.) 1904.

By W. L. Sutton. Communicated by Dr. H. F. Parsons.

Physical characteristics: bright and clear.

No free or albumenoid ammonia, nitrites, oxygen absorbed (in 4 hours at 80° F.) or poisonous metals.

Nitrogen in nitrates	·33	Grains per gallon.
Chlorine in chlorides	1·1	
Solids in solution, dried at 212° F.	16·45	

Hardness before boiling 12·8°.

"An excellent water of exceptional organic purity. The hardness is not excessive for a Chalk water. It is perfectly safe for drinking and all domestic purposes."

6. BIBLIOGRAPHY.

1. Geological Survey Publications.

Sheets of the Index Map. Scale an inch to four miles.

9. Northern part of Suffolk, 1895.
12. Southern part of Suffolk, 1895.

Sheets of the Map. Scale an inch to a mile.

By the following:—F. J. Bennett, J. H. Blake, W. H. Dalton, W. H. Penning, C. Reid, S. B. J. Skertchly, and W. Whitaker.

47. Small part, in north-eastern corner. Clare, Long Melford, Sudbury, 1881.
48 N.W. All but southern part. Hadleigh, Ipswich, Nayland, 1882.
— N.E. All but south-western corner. Felixstowe, Ipswich, Woodbridge, 1882.
49 S. Aldborough, 1883.
— N. Southwold, 1883.
50 N.W. All but northern part. Botesdale, Eye, Ixworth, 1883.
— N.E. North-western corner. Halesworth, 1884 [?1885].
— S.W. Bildeston, Lavenham, Mendlesham, Needham Market, Stowmarket, 1881.
— S.E. Debenham, Framlingham, Saxmundham, Woodbridge, 1883.
51 N.E. All but western part. Mildenhall, Thetford, 1883.
— S.E. All but western part. Bury St. Edmunds, 1882.
65 Small part on southern border, toward east. Brandon, 1886.
66 S.E. Small part on south-east. Beccles, Bungay, 1881.
67 N. Small part on south. 1881.
— S. Greater part, Lowestoft, 1882.

Section.

Sheet 128. The Cliffs of Kessingland, Pakefield, and Corton, Suffolk. (With an Explanation). By J. H. Blake.

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1895. WHITAKER, W. Some Suffolk Well-sections. *Rep. Brit. Assoc.* for 1895, pp. 436–440.

——— Underground in Suffolk and its Borders (Address to Section C.) *Ibid.*, pp. 666, etc.

1896. THRESH, Dr. J. C. Water and Water Supplies. Two Editions. A third edition 1901. (*See* Index under Sudbury and Suffolk). Small 8vo. *London.*

1901. BULLEN, Rev. R. A. Note on a Well-Section at Dallinghoo (Suffolk). *Quart. Journ. Geol. Soc.*, vol. lvii., pp. 285–8.

1903. WHITAKER, W. On some Well-Sections in Suffolk. *Quart. Journ. Geol. Soc.*, vol. lix., pp. 33–50.

1904. THRESH, Dr. J. C. The Examination of Waters and Water Supplies. Pp. xvi., 460. 8vo. *London.*

1905. WHITAKER, W. On a Great Depth of Drift in the Valley of the Stour [Boring at Glemsford]. *Rep. Brit. Assoc.* for 1904, pp. 543, 544.

A new Index Geological Survey Map, on the scale of 4 miles to the inch, is in preparation. It is based on the Ordnance Index Map, and Sheet 16, which covers Suffolk, is nearly ready. This differs from the Old Index Map in showing Drift.

POSTSCRIPT.

The following additional Well Sections came to hand after this Memoir had been set up in pages.

Clare.

For the Rural District Council. Southern side of Sheepgate Lane, 900 yards north-westward of the church, and 920 yards S.W. of the Snow Hill Borehole (p. 37).

Communicated by Messrs. SANDS and WALKER, and by Mr. G. W. WILLCOCKS. A boring, 252½ feet above Ordnance Datum.

Level of water at beginning of pumping 161½ feet above Ordnance Datum. Lowered to 158¼ by 14 days' test-pumping, at the rate of 78,000 gallons a day. After the pumping ceased the water returned immediately to the original rest-level.

		THICKNESS.	DEPTH.
		Ft.	Ft.
[Glacial Drift.]	Clay, with flints - - -	10½	10½
	Gravel - - - - - -	1½	12
	Boulder Clay - - - -	120	132
	Dark Sand- - - - - -	1	133
	Sand- - - - - - -	4	137
Chalk - - - - - - - - - -		113	250

The following analyses have come to hand just in time for insertion. The last three (unpublished) were received from Dr. PARSONS.

Lakenheath.

1. Well in a court off Anchor Lane. 2. Well near the High Street. Neither deep.

By J. NAPIER. 1892. In Dr. COPEMAN'S Report (see p. 165).

	1	2	
Total solid matters - - - -	74·86	53	grains per gallon.
Chlorine - - - - - - - - -	7·65	7·36	
Nitrogen as nitrates - - - -	1·75	1·4	
Free ammonia - - - - - - -	·106	·118	parts per million.
Albuminoid ammonia - - - -	·21	·225	

Appearance. 1. Faint yellow colour. Contained a minute quantity of vegetable matter in suspension. Living organisms visible. 2. Distinct yellow colour. Contained only a very minute quantity of vegetable matter in suspension.

Of both Mr. NAPIER says, "this water is contaminated with objectionable organic impurities, and is, therefore, unfit for drinking purposes."

Dr. COPEMAN remarks "there can, I think, be little doubt but that the high degree of contamination which would appear at present to be common to all the drinking water in Lakenheath, must be prejudicial to the health of the inhabitants.

Hitcham. Cross Green. (*See* p. 68.) By W. L. SUTTON, January, 1906.

Free ammonia	·009	grains per gallon.
Albuminoid ammonia	·0035	
Nitrogen in nitrates (no nitrites)	·03	
Chlorine in chlorides	3·9	
Solids in solution, dried at 212°F.	31·2	

Hardness, 18·3°. Physical characteristics: brownish deposit of mineral matter containing iron.

"Assuming that the reddish deposit is not derived from the water by precipitation on exposure to air, but from the pipes, this water is fit for drinking and general domestic purposes. There is no evidence of pollution by sewage or drainage-impurity."

Poslingford. Chipley Abbey. (*See* p. 98.) By DR. ATTFIELD, April, 1883.

Free ammonia	·54	parts per million.
Albuminoid ammonia	·03	
Total solids	64·	grains per gallon.
Chlorine	4·	
Nitrogen as nitrates	·02	

Hardness, 43°, permanent, 30°, Clark's scale.

Saxmundham. For Public Supply (*see* p. 102). By MESSRS. HEARON, SQUIRE, and FRANCIS. September, 1905.

The water on standing gave a reddish-brown deposit, consisting mostly of oxide of iron. The clear decanted water when vigorously shaken at a high temperature gave no unpleasant odour. The water is sufficiently pure to justify its use for drinking-purposes.

Chlorides equivalent to chlorine		5·4
Free ammonia		·014
Albuminoid ammonia		·001
Nitrates equivalent to nitric acid (no nitrites)		·741
Composition of dissolved solid matter	Insoluble solids	17·05
	Soluble solids	24·95

Hardness, 26·7°, temporary, 17·5°.

(grains per gallon)

Composition of dissolved solid matter:—

Silica	·9
Iron and alumina	·15
Carbonate of lime	16·
Sulphate of lime	10·8
Sulphate of magnesia	4·38
Nitrate of magnesia	·87
Chloride of sodium	8·9
	42

(grains per gallon.)

Dr. THRESH has sent some additional analyses in the following tabular form:—

Date.	Place.	Source.	Appearance down a long tube.	Grains Per Gallon.				Parts per Million.		
				Nitric Nitrogen.	Chlorine.	Hardness Temporary.	Hardness Total.	Free Ammonia.	Organic Ammonia.	Oxygen Absorbed.
Oct. 1901 -	Halesworth - -	Shallow well -	Clear and colourless	·12	4·4	8·2	24·	0	·03	·17
Sept. 1902 -	" - -	" -	Faint yellow -	·16	6·8	13·4	40·	0	·08	·248
Nov. 1901 -	Ipswich - -	" -	Dull and yellow -	·29	25·2	—	80·	·44	·16	1·16
Jan. 1904 -	Mildenhal - -	A softened water	" -	·22	1·4	2·4	5·	0	·09	·48
Jan. 1903 -	Reydon - -	Shallow well -	Clear and yellow -	1·16	2·8	8·	8·5	·01	·02	·19
Jan. 1904 -	" - -	" -	" -	1·2	2·6	8·5	9·	0	·08	·12
Dec. 1901 -	Shotley - -	Deep well - -	Dull and yellow -	·08	200·5	26·	116·	1·64	·02	·39
Feb. 1901 -	Southwold -	Boring in Crag -	Clear and colourless	1·11	2·9	7·	7·5	·01	·04	·14
" -	" - -	" -	"	1·1	2·5	6·5	8·	·01	·024	·088
Jan. 1903 -	" - -	Well on Common	"	2·32	11·2	14·	32·5	·05	·07	·42
Dec. 1902 -	Stratford - -	Shallow well -	Clear and yellow -	1·16	3·4	10·2	16·5	0	·06	·56
July 1901 -	Whatfield - -	Deep wel - -	Yellow and turbid	·03	5·7	10·	43·4	·56	·04	·56
Dec. 1902 -	Woolverstone -	Spring - -	Dull and yellow -	1·16	4·1	10·4	18·2	0	·14	·8
" -	" -	" another -	Clear and yellow -	1·3	3·9	11·2	15·4	·01	·04	·63

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Names of persons (authors and observers) are printed in small capitals.

Names of places are printed in italics, those not in Suffolk being preceded by an asterisk.

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